

FEDERAL ADVISORY COMMITTEE ACT
CLEAN AIR ACT ADVISORY COMMITTEE
CLEAN DIESEL INDEPENDENT REVIEW PANEL

CHAIR: DANIEL GREENBAUM

DESIGNATED FEDERAL OFFICIAL: MARY MANNERS

**Comments on EPA's
Highway Diesel Progress Review Report**

July 25, 2002

- The State and Territorial Air Pollution Program Administrators, the Association of Local Air Pollution Control Officials, and the California Air Resources Board
- Alliance of Automobile Manufacturers
- International Truck and Engine Corporation
- American Trucking Associations
- Pilot Travel Centers, LLC
- Dr. Bob Sawyer
- Mike Walsh
- The Natural Resources Defense Council and the American Lung Association
- BP America, Inc., Gary-Williams Energy Corporation, Marathon Ashland Petroleum LLC, Wyoming Refining Company, The American Petroleum Institute, The Association of Oil Pipe Lines, and The National Petrochemical & Refiners Association

**Comments of
the State and Territorial Air Pollution Program Administrators, the
Association of Local Air Pollution Control Officials and
the California Air Resources Board
on the U.S. Environmental Protection Agency's
June 2002 *Highway Diesel Progress Review***

July 17, 2002

The State and Territorial Air Pollution Program Administrators (STAPPA), the Association of Local Air Pollution Control Officials (ALAPCO) and the California Air Resources Board, as members of the Clean Diesel Independent Review Panel, are pleased to offer comments on EPA's June 2002, report, *Highway Diesel Progress Review* and, specifically, on whether EPA's report adequately addresses the four questions posed to the Panel by the agency. In paraphrased form, the four questions are:

1. What is the status of catalyzed diesel particulate filters, and will this technology be available for use on 2007 engines?
2. What is the status of NO_x adsorber technology, and will this technology be available for use on 2007 engines?
3. What are refiners' plans for producing 15-ppm sulfur diesel fuel by June 2006?
4. What is the status of new or improved desulfurization technologies?

The basis for our comments are 1) the report itself, 2) discussion which occurred at the June 27-28, 2002 Panel meeting, and 3) technical information available to STAPPA/ALAPCO and California from other sources.

Catalyzed Diesel Particulate Filters: Tens of thousands of diesel engines worldwide have been retrofitted with passive, catalyzed PM filters, and some have been in operation for over 500,000 km. Where sufficient exhaust temperature exists during common driving, and ultra-low sulfur diesel fuel is used, the evidence is clear that filter technology is effective and durable. To extend the use of filters to all applications and duty cycles requires active control of the conditions needed for regeneration. International Truck and Engine Corporation has used such an approach and has certified and is producing a heavy-duty diesel engine with a catalyzed PM filter for use in school buses. Peugeot has produced more than 100,000 light-duty diesels using an actively regenerated PM filter. The successful, on-road experience using catalyzed PM filters leaves no doubt that this technology will be available for use on all heavy-duty diesel engines on or before the 2007 model year. Although some application specific challenges remain, such as integration with NO_x adsorber technology, ash removal, and optimization to minimize the effect of back pressure on fuel consumption, none of these issues appears to be a showstopper, especially with four years of lead time remaining before the 2007 model year. At the June Panel meeting, no engine manufacturer raised any doubt regarding the

viability of catalyzed diesel PM filter use with their engines, by 2007 and, in fact, all engine makers expect to and are planning to apply catalyzed diesel particulate filters fleet-wide by 2007. Thus we believe the EPA has correctly concluded that filter technology “will be broadly applicable by 2007.” Moreover, as International’s experience with Green Diesel Vehicles clearly illustrates, if low-sulfur diesel fuel is widely available before 2007, catalyst diesel particulate filters could be introduced even sooner.

NO_x Adsorber Technology: At the time of adoption by EPA of the 2007 NO_x emission standard for new heavy-duty diesel engines, NO_x adsorber technology could be best characterized by prototypes undergoing laboratory evaluation. Neither high efficiency nor durability had been demonstrated, and sulfur contamination and the amount of fuel required to regenerate the adsorber remained major challenges. Just eighteen months later, substantial progress has been made regarding each of the major issues surrounding NO_x adsorber technology. Every major manufacturer with which EPA visited indicated that it expects its products to be emission compliance by 2007. As one engine manufacturer stated, progress “has been dramatic,” and the “velocity of improvement impressive.” The EPA report identifies improvements in NO_x conversion efficiency at both low and high temperatures. Techniques to remove sulfur from the adsorber, and changes to the substrate to reduce thermal degradation, show promise of extending durability of the system. Reduction in fuel use has also been demonstrated. Even system integration has been demonstrated in a pre-production system shown by Toyota. While challenges remain, the rate of progress in developing solutions confirms EPA’s conclusion that “industry is well on its way to develop NO_x adsorber technologies by 2007.”

It is also important to note that EPA’s rule provides for an averaging, banking and trading program that allows a manufacturer to reduce NO_x emissions by about 50 percent from 2007 to 2009, rather than by 90 percent, as required by 2010. This means that seven years remains to further improve efficiency and emission durability of NO_x adsorber systems. We agree with EPA that progress is occurring at a pace that certainly supports the feasibility of compliance by 2007. No engine or aftertreatment manufacturer has suggested otherwise.

Status of Desulfurization Technology and Refiners’ Plans for Producing 15-ppm Sulfur Diesel Fuel: Refiner members of the Panel stated that the technology to produce 15-ppm sulfur diesel fuel is well understood and available. EPA’s report corroborates this finding. EPA has also identified the milestones to be met between now and June 2006. Improved catalysts and other processing equipment are under development. Although not necessary for producing low-sulfur diesel fuel, these technologies offer the potential for lower cost, especially for smaller refiners. Refiners appear to be on track to meet the 2006 deadline for production of 15-ppm sulfur onroad diesel fuel. Refiner members of the panel did not challenge this finding. In fact, not only are small quantities of low-sulfur diesel fuel commercially available in some urban areas today – for use in retrofit and emission reduction programs – some refiners are on a schedule that would allow them to produce significant quantities of 15-ppm sulfur diesel fuel as early as next year.

Although some participants in the Panel's June meeting raised issues of supply, distribution and impacts on small refiners, these issues are outside of the charter of the Panel. EPA has, however, agreed to pursue these issues in a separate process later this year.

Summary: EPA's *Highway Diesel Progress Review* provides a fair, complete, and encouraging picture of the development of technology to meet the 2007 engine emission standards, and the 2006 requirement for low-sulfur diesel fuel. We have identified no omissions, and have heard no testimony from the Panel or others in attendance that significant barriers exist to compliance with the standards.

Alliance of Automobile Manufacturers:
Comments on EPA's *Highway Diesel Progress Review*, June 2002
Provided to the Clean Diesel Independent Review Panel
July 17, 2002

General

- EPA has provided a thorough review of progress in developing the technology to implement the highway diesel regulation finalized in December 2000.
- EPA's review demonstrates that both engine/vehicle manufacturers and refiners have made considerable progress since the rule's adoption.
- Based on the information presented in the Progress Review, the affected industries appear to be on track toward meeting the regulation's goals within the required timeframe.

Engine Technologies

- By design, the report addresses both vehicle manufacturing and refining industries. The two situations are very different, however, since the former is forcing technology in response to the regulation while the latter already has the technology and is focused, instead, on delivering the required product at least cost. EPA could have done a better job of explaining that, once the aftertreatment technology is developed, engine manufacturers will still have to go through many of the same types of steps that the refining industry is undertaking now.
 - EPA should have detailed the additional steps that manufacturers must take once the NOx adsorber technology reaches potential commercial viability. For example, once they decide which aftertreatment design to adopt, manufacturers must begin to integrate the aftertreatment with the rest of the vehicle system. This product design phase requires a lot of additional research and development.
 - EPA should have included a product development timeline in Chapter II, similar to Figure III.3 in Chapter III or to the schedules presented by EMA at the June 27 meeting.
 - EPA's report incorrectly implies that light-duty applications of the emerging PM and NOx aftertreatment technologies are practically ready for commercial introduction in this country. Presenting Toyota's achievement of Tier 2 bin 5 intermediate life emission standards further misleads the reader, since EPA fails to describe the milestones that remain to be reached, such as compliance with the supplemental tests. Further, EPA should clarify the cycle used to age the DPNR used in its test program and the sulfur level in the test fuel. Here are some examples of where such clarifications would have been helpful:
 - *"While NOx adsorbers had been applied successfully to light-duty lean-burn gasoline vehicles in Europe where the standards are somewhat less stringent, additional development was still necessary to apply them to*

diesel vehicles even in Europe." Highway Diesel Progress Review, p.5, underlined phrase added to original text.

- *"We have tested a diesel passenger car (one of the most difficult packaging situations) with a complete NOx adsorber and particulate filter system that demonstrated both exceptional emission control - albeit insufficient to achieve compliance with the Tier 2 standards - and good fuel economy."* Highway Diesel Progress Review, p.6, underlined phrase added to original text.
- *"The maintenance function for the removal of ash is relatively straightforward—namely, removing the device from the vehicle—and itself does not present a significant technical challenge for the industry."* Highway Diesel Progress Review, p.27, underlined phrase added to original text.
- *"NOx conversion efficiencies at 200 C have improved from approximately 10-30 percent to greater than 70 percent (compare curves B and D, representing catalyst formulations from 2000, with curves A and C representing catalyst formulations from 2001). While 70% conversion efficiencies are the minimum necessary for heavy-duty applications, light duty vehicles will require efficiencies above 95% to enable certification with the full set of Tier 2 standards."* Highway Diesel Progress Review, p.30, underlined phrase added to original text.
- In addition, to assure compliance with durability standards, auto (and engine) manufacturers incorporate compliance margins into their designs. It is not enough to just reach the standards; rather, manufacturers must consistently beat the standards by a wide-enough margin (proprietary to each manufacturer) before considering the technology to be viable. EPA failed to mention this need.
- EPA noted that much of the aftertreatment technology research is focused on future light duty applications because maintaining high conversion efficiencies throughout their wide operating temperature ranges is more challenging than for the narrower ranges of heavy duty applications. EPA should have highlighted, however, the other differences between light and heavy-duty applications better, including the need for additional research and development to address the transition from one application to the other. It is not at all clear, for example, that resolving the issues for light duty applications will resolve all the issues facing heavy-duty applications, and vice-versa. It would be helpful if EPA provided information on the typical range of exhaust temperatures for light duty diesel and heavy duty diesel applications.
- Similarly, EPA should have identified the research needed to go from lean-burn gasoline applications of NOx adsorbers to diesel vehicle applications (light-duty and heavy-duty) in the United States.
- EPA should include a general caution that R&D results over the next year will be critical for determining whether the new aftertreatment technologies will be viable enough to begin developing products for 2006 (the 2007 model year).

- Chapter II contains several examples of progress in aftertreatment technology. None of the figures, however, indicates the sulfur level at which the data were generated. Automakers know that 3 ppm sulfur fuel produces a significantly different response than 15 ppm sulfur fuel, for example. Indeed, it would be useful to know all the fuel quality parameters behind all the data presented.

Refinery Progress in Desulfurizing Diesel Fuel

- EPA should mention the availability of zero-sulfur fuels, such as Fischer-Tropsch fuels made from natural gas, for blending purposes when the fuel is marginally compliant.
- EPA should identify more clearly when its findings relate to refiners as opposed to refineries.

Re : Comments on EPA Highway Diesel Progress review
Patrick Charbonneau
International Truck and Engine Corp
July 17, 2002

1. Diesel PM Filters

The report accurately describes the status of the particulate filter and what the primary development needs are for 2007. Passive particulate filters are now in production for our Green Diesel Technology school buses as well as retrofit programs for vehicles that fit the profile of proper exhaust temperature and the use of 15PPM max sulfur fuel. The fact that the particulate filters are now being used in commerce enhances the development process by providing a wide range of real world usage.

The three areas of development:

1.1 Active regeneration

1.2 ash handling

1.3 pressure drop reduction

These are the primary items being focused on by engine manufacturers, vehicle manufacturers and aftertreatment manufacturers in North America, Europe and Japan. Needless to say the worldwide focus on a particular technology significantly enhances its potential for success in 2007.

2. NOx Adsorbers

The report reflects the lower maturity level of the development of this device. The primary areas of the development needs are:

2.1 Broaden temperature range

2.2 improved thermal durability

2.3 improved desulfation (both method and performance)

2.4 improved system integration.

The velocity of change of items 2.1 through 2.3 in NOx adsorber technology over the last 18 months has been rapid reflecting the finalization of the 2007 rule and the confirmation that 15 PPM fuel will be available for 80% of all on highway fuel in mid 2006. This finally allowed the entire industry to focus on one NOx reduction solution (NOx adsorbers) rather than spread out its resources on other technologies or not engage in NOx reduction technologies at all because the end product definition and need was unclear.

The report reflects the tremendous investments that are now being made by engine manufacturers, vehicle manufacturers and aftertreatment manufacturers for successful development and implementation of the NOx adsorber technology.

Because of the maturity stage of the technology the improvements are being driven by bench testing and dyno testing. The vehicle integration strategies and development

are in the infant stages. As discussed at the Panel meetings the next 12 months are keenly important for the following reasons

1. The continued velocity of change of items 2.1 through 2.3 will be confirmed
 2. The system integration strategies being developed by the industry should progress to the hardware stage.
 3. The mid 03 technology confirmation timing aligns with program timing for 2007 MY introduction.
3. Engine Combustion

The report accurately states that every engine manufacturer is pursuing combustion system improvements to minimize engine out emissions and to improve fuel economy. Though two light duty combustion systems were used as examples the EPA correctly added that it is not clear if these types of combustion strategies are relevant for heavy duty diesels.

Before the
United States Environmental Protection Agency
Office of Air and Radiation



Driving Trucking's Success

Comments on
The United States Environmental Protection Agency
Office of Transportation and Air Quality
Assessment and Standards Division
Draft Report on:
Highway Diesel Progress Review
(June 2002)

To: **Ms. Mary Manners**
Designated Federal Official
U.S. Environmental Protection Agency
Office of Transportation and Air Quality

July 18, 2002

Introduction

The American Trucking Associations, Inc. ("ATA") submits the following comments in response to the U.S. Environmental Protection Agency's ("EPA" or "Agency") Draft Report entitled *Highway Diesel Progress Review* ("Draft Report").

ATA is the trade association representing the American trucking industry.¹ As the national representative of the trucking industry, ATA is vitally interested in matters affecting the nation's trucking fleets. The membership of ATA strongly supports the achievement of cleaner air and the protection of human health and the environment.

ATA is a united federation of motor carriers, state trucking associations, and national trucking conferences created to promote and protect the interests of the trucking industry. Its membership includes more than 2,000 trucking companies and industry suppliers of equipment and services. Directly and through its affiliated organizations, ATA encompasses over 34,000 companies and every type and class of motor carrier operation. As such, it effectively represents the interests of the trucking industry in the United States.

ATA's longstanding role of representing the interests of the trucking industry is all the more significant in this instance because the 2006/2007 Diesel Rule ("Rule") will have a dramatic impact on the trucking industry. In terms of scope, the highway diesel fuel and heavy-duty engines that are the subject of the Rule are used almost exclusively by members of the trucking industry. In terms of impact, the Rule will impose requirements that potentially affect every aspect of the trucking business, including capital costs of acquisition, the availability and cost of fuel for operations, equipment life, maintenance requirements and regulatory compliance.

Overview of the Trucking Industry in the United States

The trucking industry is composed of both large national enterprises as well as a host of small businesses whose livelihood can be dramatically impacted by new regulatory requirements. According to the Department of Transportation, almost 50% of motor carriers have only one truck, and fully 95% of motor carriers (nearly 395,000 in number) have 20 or fewer trucks.²

¹ ATA is a united federation of motor carriers, state trucking associations, and national trucking conferences created to promote and protect the interests of the trucking industry. Its membership includes more than 2,000 trucking companies and industry suppliers of equipment and services. Directly and through its affiliated organizations, ATA encompasses over 34,000 companies and every type and class of motor carrier operation.

² Federal Motor Carrier Safety Administration, Docket Item FMCSA 1997-2350-954, Preliminary Regulatory Evaluation (Truck Driver Hours of Service), page 60, paragraph 3.

The trucking industry is a major force in the United States economy,³ employing 9.7 million people in jobs that directly relate to trucking.⁴ Trucking accounts for 86 cents of every dollar collected for freight transportation in the U.S., and trucking hauls practically every type and kind of product and raw material used in the manufacturing and retail sectors of the economy.

Moreover, as the predominant mode by which U.S. consumers receive virtually all of their goods, the trucking industry ensures the availability and cost-effective distribution of finished goods and raw materials throughout all segments of the economy. In this regard, over 70 percent of all communities in the United States rely *exclusively* on trucks to deliver all of their fuel, clothing, medicine, and other consumer goods. In sum, the nation's trucking industry provides the essential transportation resources, infrastructure and services that are necessary to sustain the growing economy that benefits all Americans.

Comments

ATA has a direct and substantial stake in the development and implementation of the technology required for the new heavy-duty diesel engines, the necessary emission control systems, and the ultra-low sulfur diesel fuel required under the Rule. We represent the end users that will purchase, maintain, and bear the costs of this equipment and fuel. Our objective, like that of EPA, is quite simply to ensure that this equipment and fuel is available, reliable and cost-effective.

This Independent Review Panel ("Panel") has a valuable role in reviewing and assessing the progress being made in these areas and for that reason ATA sought membership on this Panel. ATA appreciates the opportunity to represent the interests of trucking fleets who will be the ultimate consumers of both the new engines and fuels. In advocating the interests of our members, ATA will continue to raise issues of concern. Though we may not always have readily-available answers to many of the issues we will raise as the Panel process deliberates, we will continue to raise the critical concerns as we see them contrary to EPA's direct request for us "...not to raise issues unless we have solutions".

The assessment of the technical progress made to date on the Rule and the challenges to achieve the standards remain overly optimistic. Specifically, ATA's concerns are as follows:

- No discussion of the particular applications engineering is given. How this critical area to vocational applications can be ignored is puzzling.
- SAE publication references are cited throughout the Draft Report. SAE does not employ rigorous peer review on its papers and routinely publishes product information by the product supplier and not an independent evaluator.

³ The importance of the trucking industry to the nation's economic well-being has been documented previously in the context of EPA's September 16, 1997 Regulatory Impact Analysis accompanying the final rule establishing emissions standards for Heavy Duty Engines. See 62 Fed. Reg. 54694 (October 21, 1997).

⁴ American Trucking Trends: The Essential Guide to Trucking Facts and Figures (2000).

- The Draft Report discusses the technical progress of PM management and NO_x reduction but does not adequately address the negative synergistic effects of controlling them simultaneously.
- The Draft Report does not discuss the technical property changes of ULSD regarding engine performance. Issues of long-term durability, maintenance, and power output are not adequately discussed.
- The Draft Report does not discuss the energy density issue of ULSD as a result of the anticipated refining process compared to 350/500 ppm sulfur and what the potential economic, technical, and productivity effects are with a lower energy density fuel.
- The Draft Report does not analyze or discuss any of the productivity losses relating to the added mass and volume of after treatment devices on the truck.
- The Draft Report does not analyze or discuss the productivity losses from any additional routine maintenance or repairs to the after-treatment devices.
- The Draft Report does not discuss the potential failure modes and effects of the after-treatment devices such as sulfur poisoning.
- The Draft Report does not discuss any potential highway safety issues regarding the proposed active regeneration technology which employs injecting fuel into the exhaust system to induce an out-of-engine incineration of particulate matter.
- The Draft Report does not address the various fueling modes that are used throughout the industry.
- The Draft Report does not address the cost of fuel adequately and the relationship of fuel costs to business failures.
- The Draft Report does not discuss the added costs to capped fuel price programs that are contractual.
- The Draft Report does not address the added system costs with tax compounding.
- The Draft Report does not address life cycle costs.
- The Draft Report does not address development timing accurately especially regarding long-term durability testing after application engineering.
- The Draft Report does not discuss any technological development required by secondary manufacturers that are "final producers" to truck chassis or vocational units.

- The Draft Report does not take a systems approach to other developing technologies that require vehicle integration. For instance, no discussion of vehicle networking/data bus capabilities and capacity is given.
- The Draft Report completely ignores the lubricant and fuel in-use delivery.
- The Draft Report ignores the failure assignment identification process relating to warranty regarding sulfur poisoning.
- The Draft Report does not discuss the status of the engineering and development tools necessary to design these systems, specifically, the measurement technology for emissions level verification.
- The Draft Report does not discuss the need for prognostic technology development, in particular, hardware and software necessary for emissions performance in-use evaluation and maintenance.
- The draft report does not discuss in-use performance testing equipment and procedures for emissions compliance warranty confirmation.

Procedural Recommendations

ATA wants to avoid a repeat of the situation that is currently confronting trucking fleets as a result of the up-coming October 1, 2002 deadline to reduce nitrogen oxide emissions. By way of background, on October 1, 2002, the U.S. Environmental Protection Agency ("EPA") will begin enforcing a new nitrogen oxide plus non-methane hydrocarbons emission standard of 2.5 grams per brake horsepower hour against virtually all domestic manufacturers of on-highway, heavy-duty diesel engines, 15 months earlier than the original federal deadline of January 1, 2004. Under normal circumstances, new engines are extensively field-tested by fleets for at least two complete seasons for thousands of miles far in advance of formal introduction. With less than three months remaining before EPA's October 1 deadline, only a few fleet owners have been provided a handful of engines to test. As of today, EPA has certified only one engine that will meet the upcoming standard and that sole engine approval is the subject of a current legal challenge.

Our industry only recently became aware that the life-cycle costs for complying with 2002 diesel engine emission requirements will be 12 to 18 times higher than those originally estimated by EPA in 1997. One recent economic report concluded that the increased life cycle costs associated with the purchase and operation of new exhaust gas recirculation heavy duty engines will be \$11,057 to \$15,892 per vehicle, a figure dramatically higher than the \$907 life cycle cost estimate EPA used to support its 2004 Heavy Duty Diesel Rule. This situation is unacceptable and has forced trucking fleets to seek relief from the October 1, 2002 compliance deadline notwithstanding the fact that engine manufacturers had nearly four years to of lead time to produce, certify, and test these engines. The hard lesson we have learned, and EPA should learn, is that rosy projections from manufacturers are a poor substitute for assessing progress. It is a

discipline that requires realistic timetables, based on understanding the lead times involved in the commercial production and sales of these integrated systems and periodic fact gathering from manufacturers to objectively measure the progress. The commercial development demands for the 2007 heavy duty diesel engines and low sulfur fuel in 2006 are many times more complicated and costly than the 2002 engines emission standards. Unless a proper evaluation process is implemented now, EPA can expect the same results -- namely, a delay in clean air benefits, as trucking companies avoid the risks involved in purchasing this equipment until it is properly tested for reliability and durability.

ATA's comments not only evaluate the Draft Report, but more importantly, recommend a process, including timetables and a reporting mechanism, to annually review the stages of development, production, distribution, and deployment, over the next several years. Our substantive comments on the Draft Report were prepared after evaluation by ATA's Technical Advisory Group ("TAG"). TAG is comprised of the trucking industry's leading engineers, fleet managers, and technical experts who are knowledgeable about truck engines and their component systems.

At the outset, it is important to emphasize to EPA and this Panel that a successful implementation of these new engine and fuel requirements necessitates close cooperation between various manufacturers and suppliers, including emission control manufacturers, truck manufacturers, and our members who are the truck purchasers. Emission control manufacturers must have their technology available for engine manufacturers to select and incorporate into their designs within a year according to EMA during its presentation to the Panel on June 27. They in turn must have their engines and emission control prototypes available by mid-2004 for truck manufacturers to incorporate into their production of heavy duty tractors and trucks. At least one year of development testing by engine manufacturers is critical. The trucking industry, who are the ultimate consumers, validate and provide essential real world experience for feedback to the engine emission control system and vehicle manufacturers.

There is a similar need to recognize the timeframes and interdependence on the diesel fuel side. Progress cannot be measured alone at the refiners' level that is merely the first step in the process. The delivery and distribution companies' capabilities, and the retailer or truck stop operators' capabilities, must also be measured and in place so that there are no fuel shortages or areas where the supply is inadequate to meet the demand of the trucking industry. Since the new engines will malfunction using current diesel formulations, the ramifications for fuel inadequacies cannot be underestimated. Our nation's commerce and our trucking industry's service depends upon an adequate fuel supply in urban cities and rural towns nationwide.

Some Panel members have referred to this regulatory undertaking as a "three-legged" stool with its reliance upon new interactive engines, new emissions control devices, and an ultra low 15 ppm sulfur diesel fuel. Any delay in one will cause a delay in the entire system. All three legs must be firmly in place or the stool will collapse.

We concur with EMA's points made during its presentation to the Panel in that EPA should monitor progress through a systems approach which recognizes the interdependence of engine modifications, after treatment technologies, vehicle integration fuel improvement and lube oil

reformulation. While 2006 and 2007 may be the regulatory timeframe for these fuel and equipment changes respectively, the actual commercial development, production, and sale timeframes are far shorter if implementation is to occur without delay and problems in 2006 and 2007. Therefore, the state of progress in 2002 should not be based on a 4 to 5-year lead-time as the Draft Report suggests.

EMA suggests that July 2003 – only 12 months from now – is the critical date for final technology selection. The emissions control manufacturers must have their components available by that time for engine manufacturers to select and integrate them into engine designs. In turn, the manufacturers of the trucks need the engine specifications for their production planning and the trucking industry itself needs 15 months for testing – all of which must occur before 2007.

For these reasons, ATA recommends that this Panel ask EPA to develop realistic commercial timetables to measure the progress of the following:

- (1) Emission control device manufacturers;
- (2) Heavy duty engine manufacturers;
- (3) Heavy duty truck manufacturers;
- (4) Diesel fuel refiners; and
- (5) Diesel fuel distributors, retailers and wholesalers.

Each of the manufacturers and vendors should be asked by the Panel to provide this information to EPA. The Rule contains registration and reporting requirements for the petroleum industry. These requirements are set forth on pages 55 through 57 of the Draft Report. If EPA has drafted these “pre-compliance report” questionnaires, we ask they be provided to the Panel. Similar pre-compliance reporting requirements, either mandatory or voluntary, should be established for the emissions control manufacturers, engine manufacturers, and heavy duty truck manufacturers. Annual or semi-annual report questionnaires should capture information from each of them on:

- (1) Status of development;
- (2) Production levels or expected production dates;
- (3) Production quantities;
- (4) Capabilities of their equipment; and
- (5) Impact on costs relating to fuel consumption, maintenance cycles, and reliability.

The manufacturers to EPA should certify the completeness and accuracy of this information. This is one recommended approach to obtaining more current information and to avoid broad representations by suppliers that progress is being made. ATA recommends that this Panel request EPA to draft such pre-compliance reports questionnaires and provides them to the Panel before its August meetings, if possible.

In addition, ATA recommends that the Panel review process be made on-going by EPA and not lapse at year-end. As discussed at the June 27th and 28th Panel meetings, the questions and recommendations that will be placed in the “bin” for EPA to evaluate in the future are likely to be more significant than

those that will appear in this year's progress report. Next year is the first critical date where statements about progress can be measured with reality. ATA believes that this Panel should formally request EPA Administrator Whitman to annually renew this independent review process.

We thank you for the opportunity to submit our comments and recommendations on behalf of this nation's trucking fleets.

Respectfully submitted,

S. William Gouse III
Vice President for Engineering
American Trucking Associations, Inc.

cc: Glen P. Kedzie, ATA Assistant General Counsel

***NATIONAL ASSOCIATION OF CONVENIENCE STORES
NATIONAL ASSOCIATION OF TRUCK STOP OPERATORS
PETROLEUM MARKETERS ASSOCIATION OF AMERICA
SOCIETY OF INDEPENDENT GASOLINE MARKETERS OF AMERICA***

June 4, 2002

The Honorable Jeffrey R. Holmstead
Assistant Administrator for Air and Radiation
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Ms. Margo Oge
Director
Office of Transportation and Air Quality
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Re: Scope of Issues to be Addressed By Clean Diesel Independent Review Panel

Dear Mr. Holmstead and Ms. Oge:

I am writing as a member of the Clean Diesel Independent Review Panel (the "Panel") to urge the Environmental Protection Agency ("EPA") to expand the scope of the Panel's charge from EPA.

On behalf of the National Association of Convenience Stores ("NACS"), the National Association of Truck Stop Operators ("NATSO"), the Petroleum Marketers Association of America ("PMAA"), and the Society of Independent Gasoline Marketers of America ("SIGMA"), I urge you to have the Panel examine, and produce recommendations to EPA regarding, at a minimum, the following issues:

- (1) refiner plans to produce 500 ppm fuel between 2006 and 2010 under the phase-in, geographic flexibility, and/or small refiner provisions of the rule;
- (2) the impact of the final diesel sulfur rule on overall diesel fuel supply and the possibility of diesel fuel shortages starting in 2006;

(3) technical issues relating to transportation of ultra-low sulfur diesel fuel through the nation's fungible grade pipeline and tanker truck system, including issues relating to contamination, testing, and downgrading of product;

(4) misfueling and liability issues for diesel fuel marketers; and,

(5) equipment modifications for both heavy duty vehicles and diesel fuel retailers that may be required to implement the ultra-low diesel sulfur program.

The diesel fuel marketing groups I represent on the Panel assert that a failure by EPA to expand the scope of the Panel's charge will represent the loss of a golden opportunity to address these important issues with virtually all stakeholders present. Heavy duty vehicle manufacturers and operators, diesel fuel retailers, and diesel fuel producers all must make significant economic investments in the coming three years to comply with the final diesel sulfur rule. These investments cannot be made until the issues outlined above are addressed. For example:

- If few refiners outside of PADD IV plan to produce 500 ppm on-road diesel fuel after mid-2006, then most retailers east of the Rocky Mountains may not make the economic decision as to whether to install additional diesel fuel underground storage tanks to provide their customers with a choice between 500 ppm and 15 ppm diesel.
- If fuel contamination issues are not adequately addressed upstream, retailers may have an obligation to test the 15 ppm diesel fuel delivered to their retail outlets to insure it does not violate the final rule's sulfur cap. Is field testing equipment sensitive enough to reliably measure sulfur levels under 15 ppm commercially available, or will it be by mid-2006?
- If a diesel retailer faces potential liability for intentional or mistaken misfueling of vehicles, then the retailer may choose to offer only 15 ppm diesel to its customers. This bias against 500 ppm diesel could negate the refiner flexibility sought by EPA in adopting the 80%/20% phase-in provisions of the final rule.
- If heavy duty vehicle manufacturers are not required to install fill-pipe equipment to prevent intentional or mistaken misfueling, then diesel retailers may not choose to offer two grades of on-road diesel fuel to their customers. Again, such decisions could impact the flexibility EPA has attempted to grant to refiners in the final rule.
- If EPA requires diesel retailers to replace dispenser nozzles to work with fill-pipe equipment to prevent misfueling, then retailers need to know about these requirements at least 36 months in advance of the requirement to order appropriate equipment and phase out existing equipment during the regular course of business.

In short, there are many technical questions and issues, rather than technological questions and issues, that should, and can, be addressed by the Panel over the next four months. To neglect these issues when most stakeholders already are assembling to consider other issues does not further either EPA's or the stakeholders' interests.

It is no secret to EPA that NACS, NATSO, PMAA, and SIGMA have not supported several provisions of the final diesel sulfur rule. These organizations were supportive of the environmental objectives of the rule, but were concerned with the rule's impact on diesel fuel supplies and the phase-in of the 15 ppm standard. However, at this point, all of these organizations believe that it is important to focus on implementing the rule's provisions -- no matter how much they disagree with them -- in an efficient and cost-effective manner.

NACS, NATSO, PMAA, and SIGMA are not looking for further confrontation during the Panel's work. We are not seeking to re-open the final diesel sulfur rule through this forum. Rather, we are seeking a forum to discuss several important implementation issues that must be addressed by EPA in the near future.

If EPA does not expand the Panel's charge to include the issues contained in this letter, I will continue to serve on the Panel and will be of whatever assistance to the Panel in its work that I can. However, I respectfully request a specific written response from EPA as to when, and in what forum, EPA intends to address these issues if not during the Panel's deliberations. EPA made a commitment in the Preamble to the final diesel sulfur rule to address many of these issues and diesel fuel retailers need to know with certainty when they can expect guidance from EPA on these issues.

Thank you for your attention to the issues raised in this letter. If you or your staff have questions, please do not hesitate to contact me at 865-588-7488 Ext. 2558 or Gregory Scott, counsel to NACS and SIGMA, at 202-342-8646.

Sincerely yours,



Alan Wright
Vice President
Pilot Corporation
5508 Lonas Drive
Knoxville, TN 37909

cc: Members of the Clean Diesel Independent Review Panel
Senator James Inhofe



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUN 25 2002

OFFICE OF
AIR AND RADIATION

Mr. Alan Wright
Vice President
Pilot Corporation
5508 Lonas Drive
Knoxville, TN 37909

Dear Mr. Wright:

Thank you for your letter of June 4, 2002, requesting to expand the scope of the charter for the Clean Diesel Independent Review Panel ("Panel"). As you know, the 2007 Highway Diesel Program is one of the most important public health programs that the Environmental Protection Agency (EPA) has developed. Many stakeholders are relying on the successful introduction of the clean engines and low sulfur diesel fuel incorporated into this program.

For the Panel to successfully complete its charge by September 30, its scope must remain focused on the progress of the technology needed to comply with the program's requirements and not expanded to include the broad range of implementation and technical issues that are more appropriate for the Agency to deal with directly. While the Panel process is not the appropriate forum to address the implementation-related issues that you raised in your letter, we believe those issues are important and we are committed to working with you and all other relevant stakeholders to discuss them.

We believe the following process is the most appropriate way to address the fuel supply, distribution, and other implementation-related issues that may be raised in the future. As a first step, we plan to schedule a series of implementation workshops on both fuel and engine issues. These workshops, which will be open to interested parties, could result in guidance documents, question and answer documents, or technical amendments to the regulations, if necessary. We intend to hold the first of these workshops in November and will work with you and the other stakeholders to identify the appropriate issues and participants prior to that meeting. It is my understanding that my staff have been in contact with Mr. Greg Scott of Collier Shannon Scott, PLLC, and have arranged for a meeting on July 23 to initiate these discussions with you and other retailer/marketer stakeholders. Following the November workshop, we plan to hold subsequent workshops and technical meetings periodically as necessary as we approach the program's implementation date.

- 2 -

Again, thank you for your letter. I appreciate the opportunity to be of service and look forward to working with you to ensure the successful implementation of the program. If you have further questions, please contact Paul Machiele at (734) 214-4264.

Sincerely,

A handwritten signature in black ink, appearing to read "Jeff Holmstead", written in a cursive style.

Jeffrey R. Holmstead
Assistant Administrator



"Robert F. Sawyer"
<rsawyer@me.berkeley.edu>

To: Dgreenbaum@healtheffects.org, Mary
Manners/AA/USEPA/US@EPA

cc:

07/12/2002 01:31 PM Subject: EPA Diesel report

Dan and Mary--

I am off to Japan for three weeks without having detailed my comments on the report. I have two issues:

1) I am not accustomed to reviewing technical documents where the data (mostly) are not included. What data are presented are primarily for light duty applications (which are not necessarily more demanding as suggested). I have little basis for judging the performance and durability. It is reassuring the industry seems comfortable with the report and conclusions.

2) The report needs some consideration of byproduct formation.

Bob

Robert F. Sawyer

Professor in the Graduate School

University of California

Mechanical Engineering Department

Berkeley CA 94720-1740

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email: rsawyer@me.berkeley.edu

url: <http://www.me.berkeley.edu/faculty/sawyer.html>

COMMENTS OF MICHAEL P. WALSH ON THE QUESTIONS POSED TO THE INDEPENDENT DIESEL REVIEW PANEL.

Response To Questions

1. What is the current status of the NOx adsorber technology to meet the provisions of the HD 2007 regulations given diesel fuel with a sulfur cap of 15 ppm? Is industry making progress to develop NOx adsorbers in a timely manner? Are the necessary resources and plans being put in place to ensure that the technology will be available in 2007? What other engine technologies are being pursued/developed to enable or facilitate the application of NOx adsorbers?

Over the last year and a half EPA pointed out that it met with a number of engine and vehicle manufacturers along with emission control system and component manufacturers in order to review progress to develop the NOx adsorber catalyst for introduction in 2007. In addition, EPA tested a NOx adsorber system on a heavy-duty diesel engine in its laboratory and tested a complete light-duty vehicle with a NOx adsorber system over the regulated emission cycles. EPA's review showed that the NOx adsorber catalyst and the associated system changes required to enable it are continuing to develop at a rapid pace. Given the short time window since December 2000, the substantial progress realized in that short time, and the relatively long lead-time between now and 2007, and especially 2010, EPA concluded that continued development of the technology would lead to its successful implementation.

It was clear from the data presented to EPA that the progress with regard to NOx adsorber performance was both substantial and broadly realized by most technology developers. Although it is still early in the process, every major engine manufacturer that EPA visited told EPA that they expect to have emission-compliant products in 2007.

Significant progress has been made regarding each of the major issues confronting the NOx adsorber technology.

A. Operating Temperature Window

NOx adsorber performance has been limited at very high temperatures (due to thermal release of NOx under lean conditions) and very low temperatures (due to poor catalytic activity for NO oxidation under lean conditions and low activity for NOx reduction under rich conditions) as described extensively in Chapter III of the HD 2007 RIA. According to both EPA and MECA, significant progress has been made to broaden the temperature "window" (temperature range of effective NOx control) of the NOx adsorber catalysts.

B. Control Efficiency

The catalyst development companies that EPA visited showed EPA a number of new catalyst formulations with improved performance. Similarly, many of the engine manufacturers EPA visited shared data with EPA that show the improvements in catalyst formulations corresponded to improvements in emission reductions over the regulated test cycles.

C. Durability Improvements

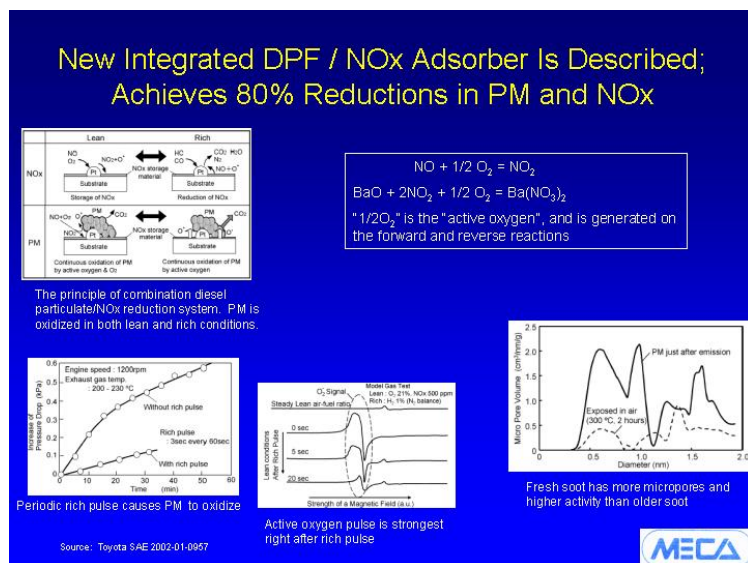
Long-term durability has been the greatest concern for the NO_x adsorber catalyst as EPA explained in the HD 2007 RIA. EPA had concluded in the RIA that, in order for NO_x adsorbers to effectively control NO_x emission throughout the life of a heavy-duty diesel engine, the fuel sulfur level would have to be maintained at or below 15 ppm, the NO_x adsorber catalyst thermal durability needed to improve in order to allow for sulfur regeneration events, and system improvements would have to be made in order to allow for appropriate management of sulfur poisoning. It is in this area of durability that EPA concluded that NO_x adsorbers had the greatest need for improvement, and it is here where EPA found some of the most impressive strides in technology development have been made. During its review, EPA learned that catalyst companies are making significant improvements in the thermal durability of the catalyst materials used in NO_x adsorbers. Similarly, EPA found that the substrate manufacturers are developing new materials that do not react with the NO_x storage materials (storage catalyst interaction with the catalyst substrate has been an important degradation mechanism). The net gain from these simultaneous improvements is NO_x adsorber catalysts which can be desulfated (go through a sulfur regeneration process) with significantly lower levels of thermal damage to the catalyst function. In addition, according to EPA engine manufacturers and emission control technology vendors are developing new strategies to accomplish desulfation that allow for improved sulfur management while minimizing the damage due to sulfur poisoning. It was clear in EPA's review that the total system improvements being made when coupled with changes to catalytic materials and catalyst substrates are delivering significantly improved catalyst durability to the NO_x adsorber technology.

D. Practical Issues

Practical application of the NO_x adsorber catalyst in a vehicle was a major concern of the industry during the HD 2007 rulemaking. Although there was considerable evidence that NO_x adsorbers were highly effective and that durability issues could be addressed, some worried that the application of the NO_x adsorber systems to vehicles would be impractical due to packaging constraints and the potential for high fuel consumption. EPA's review of progress,

however, left EPA more certain than ever that practical system solutions can be applied to control emissions using NOx adsorbers. EPA has tested a diesel passenger car (one of the most difficult packaging situations because of the space limitations) with a complete NOx adsorber and particulate filter system that demonstrated both exceptional emission control and good fuel economy. Heavy-duty engine manufacturers have shared with EPA their improvements in system design and means to regenerate NOx while minimizing fuel consumption.

Similarly the various Department of Energy (DOE), Advanced Petroleum Based Fuel - Diesel Emission Control (APBF-DEC) program NOx adsorber projects are working to address the system integration challenges for a diesel passenger car, a large sport utility vehicle and a heavy heavy-duty truck. The challenge of full system design and implementation for the NOx adsorber catalyst remains but the number of entities working to resolve the issues and the substantial success to date suggests that these issues will be overcome.



MECA also presented data showing an integrated DPF/NOx adsorber system developed by Toyota.

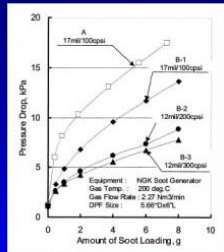
2. What is the current status of catalyzed diesel particulate filters (CDPF) to meet the provisions of the HD2007 regulations given diesel fuel with a sulfur cap of 15 ppm? Is industry

making progress to develop the catalyzed diesel particulate filter in a timely manner? Are the necessary resources and plans being put in place to ensure that the technology will be available in 2007?

CDPFs have been introduced in retrofit applications with great success where low sulfur diesel fuel is available. The CDPFs available at the time of the rulemaking provided dramatic emission reductions and good robustness for soot regeneration for most applications. Yet further improvements in CDPFs have continued including even better soot regeneration characteristics, better methods for dealing with oil ash, and reduced exhaust restrictions (reduced exhaust backpressure) while maintaining a high level of emission control effectiveness.

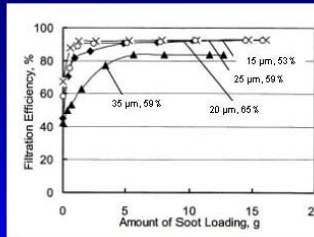
For example, as pointed out by MECA during its presentation, improved substrates are reducing backpressure, as illustrated below.

Cordierite Filters Are Improving as Pore Changes and Filter Geometry Are Being Understood

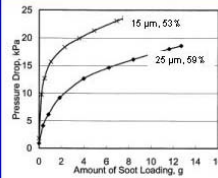


At higher cell densities, back pressure is strongly dependent on wall thickness. Porosity is 59% w/ 25 µm avg. (Type A is 53% and 15 µm)

Source: NGK 2002-01-0322



Filtration efficiency by mass is dependent on pore size if > 25-30 µm



Pressure drop of washcoated filters can be dropped with pore engineering, 300/12, 100/gitter



EPA also observed that industry has made improvements in the CDPF technology. CDPF catalyst systems have improved soot oxidation characteristics for passive filter regeneration. Total vehicle systems are being introduced that provide an

active regeneration backup to ensure that under all driving conditions PM filters can regenerate. Every engine manufacturer that EPA visited was working on engine and emission control systems to ensure robust PM regeneration characteristics under all driving conditions. One manufacturer has even shown that the periodic NOx regeneration function necessary for proper NOx control can provide a synergistic improvement in PM soot regeneration. Based on the information shared by industry, EPA noted that it is more convinced than ever that, given low sulfur diesel fuel, CDPFs can be implemented with good soot regeneration characteristics on all heavy-duty diesel vehicles. In fact, one engine and vehicle manufacturer, International Truck and Engine Company, has already certified an engine with a CDPF that meets the HD 2007 emission standards for PM and hydrocarbons (HCs) for use in fleets where 15-ppm sulfur diesel fuel is already available.

Although some application-specific technical challenges remain for CDPFs, all of the engine manufacturers expect and are planning to apply this technology fleet-wide by 2007. Furthermore, it is clear, as evidenced by International Truck and Engine Corporation's Green Diesel Vehicles, that if low sulfur diesel fuel was broadly available prior to 2007, CDPFs could be introduced even sooner.

3. Which refiners have announced their plans for producing low sulfur diesel fuel by June 2006? Where are refiners in their decision making/planning process for complying with the low sulfur diesel program requirements? Are the necessary resources and plans being put in place to ensure that refiners are on track for meeting the 15 ppm sulfur diesel standard in 2006?

EPA's progress review shows that the technology needed to desulfurize diesel fuel to 15-ppm sulfur is well understood and will produce compliant fuel. While it is still early in the process given the 2006-2010 window for compliance, the refining industry is where EPA anticipated it to be at this point in time. Moreover, some refining companies are ahead of schedule and will be capable of producing significant volumes of 15 ppm sulfur diesel fuel as early as next year. In fact, small amounts of 15-ppm sulfur diesel fuel are being produced today for use in retrofit and emission reduction programs in some metropolitan areas.

In meeting the 15-ppm diesel fuel sulfur standard, which is expected to result in highway diesel fuel being desulfurized down to about seven ppm, refiners are

expected to take a number of actions, including the following:

- Upgrade to a higher activity catalyst in the existing reactor of a revamped highway diesel hydrotreater,
- Add a second reactor vessel to increase catalyst volume with some or most of the reactor volume being comprised of a nickel-molybdenum (Ni-Mo) catalyst,
- Scrub the hydrogen sulfide (H₂S) out of the recycle hydrogen gas,
- Use improved liquid distributors to improve the distribution of the liquid over the catalyst bed,
- Increase the hydrogen partial pressure by increasing the hydrogen purity available from the source, or increase the amount of recycle gas,
- Increase the reactor temperature of the current highway diesel hydrotreater, or operate the first reactor of a new hydrotreater at a higher temperature,
- Scrub the H₂S from the liquid/gas mix between the first reactor (existing reactor in the case of revamps) and second reactor.

The Agency estimated that achieving a 15 ppm sulfur cap using a conventional Ni-Mo catalyst and applying a combination of the changes described above would require 480 standard cubic feet of hydrogen per barrel (scf/bbl) of diesel feed. This hydrogen consumption value assumed a diesel fuel that would be composed of a typical mix of blend stocks.

The technology choice for achieving a 15-ppm sulfur level must also consider whether the existing hydrotreater will be revamped, or whether it will be replaced with a new highway diesel fuel desulphurisation unit. After discussing this issue individually with vendors and refiners and at a refining industry technology sharing meeting, EPA estimated that 20 percent of highway diesel fuel, on average, would be produced by new highway diesel hydrotreaters, while the other 80 percent of the volume would be produced by revamped hydrotreaters. EPA also concluded that sufficient time and resources (engineering and construction, in particular) were available for implementation of the technology by the program's compliance date.

No one has challenged this conclusion.

4. What is the current status of new or improved desulphurisation technologies?

The feasibility of complying with the highway diesel fuel sulfur standard is enhanced even further through advances in conventional technologies. These advances are associated with improvements in existing catalyst technology or other developments associated with diesel desulphurisation. The improvements in catalyst technology fall into three primary areas: 1) incremental improvements in current catalyst technology, 2) significant improvements in the coatings used on catalysts, and 3) improvements on the substrate used with catalysts.

E. Incremental Improvements in Catalyst Technology

Three vendors with whom EPA spoke regarding diesel desulphurisation mentioned that their companies were planning to announce a new line of desulphurisation catalysts before the June 2006 compliance date for the HD 2007 program.

IFP is one of these. Its previous catalysts were designed primarily for realizing improvements in density and cetane for the European and Asian markets. However, IFP announced that, by the end of 2002, it will be selling a new line of catalysts for the U.S. refining industry which will focus strictly on deep desulphurisation of diesel fuel for meeting the 15 ppm sulfur standard.

Haldor Topsoe also announced that it would make another line of catalysts available in 2002 or 2003.

Finally, Criterion Catalysts stated that it would be making another line of catalysts available before the program's June 2006 compliance date.

These vendors did not provide estimates of the desulphurisation efficiency improvement that these catalysts would deliver. However, the past improved catalyst introduced by Haldor Topsoe (comparing TK-574 to TK-554) would allow an existing hydrotreater to desulfurize the same untreated feed at the same reactor conditions down to 280 ppm versus 400 ppm with the previous catalyst. Criterion's most recent catalyst introduction, Centinel, is 80 percent more active than conventional catalysts used in the mid 1990s. This increased activity is achieved by better dispersion of the active metal on the catalyst substrate. While these new or improved catalysts are not sufficient to enable an existing hydrotreater to meet the 15-ppm sulfur standard, they can help to reduce the size of the second reactor, and the amount of additional catalyst needed.

F. Catalyst Coatings

Last year, Akzo Nobel announced a new highly active catalyst named Nebula that offers a different way in which coatings are used for catalysts. A typical catalyst is composed of two parts: an active coating that contains metals and a generally inactive substrate. For Nebula, Akzo Nobel concentrated the metal coatings and omitted the substrate. Because of the very high metals content, Nebula costs several times more than conventional catalysts. The higher activity of the Nebula catalyst leads to an increased tendency for coking, which must be countered by using a high hydrogen partial pressure, resulting in higher hydrogen consumption. (The Desulphurisation catalysts are manufactured by applying Cobalt-Molybdenum (Co-Mo) or Nickel- Molybdenum (Ni-Mo) metals to a substrate.) Hydrogen consumption is higher because a higher percentage of the

aromatics are saturated to nonaromatic compounds. According to Akzo Nobel, a refiner may be able to meet the 15-ppm sulfur standard by simply replacing its existing catalyst with Nebula and providing significantly more hydrogen (which may possibly require the addition of a hydrogen plant). However, it is conceivable that a refinery located on the Gulf Coast that has an external supply of hydrogen could meet the 15-ppm sulfur standard with only a catalyst change, avoiding significant capital costs.

While Nebula is a new catalyst that could avoid some or much of the capital investment that would otherwise be required for meeting the 15 ppm sulfur standard, another company said that it is experimenting with using its previously developed catalyst technology for meeting the 15 ppm sulfur standard. Criterion catalysts indicated that it is working with some refiners to use its Synshift catalyst technology to meet the 15-ppm sulfur standard. The Synshift technology is a ring opening technology that would open at least one of the aromatic rings of polyaromatics.

Like the Nebula catalyst, the Synshift catalyst would trade higher hydrogen consumption for capital costs as an existing large, higher pressure (1000 psia) highway diesel fuel reactor could be used to meet the 15 ppm sulfur standard with potentially only a change in catalyst. The result of this commercial testing is expected to be made available within a year.

Another catalyst vendor shared some information about its catalyst development program that involves advances in the geometry of its substrate. These advances have resulted in significant improvements in the contact of diesel fuel with the catalyst. The vendor also shared that it is combining its substrate technology with other reactor enhancements to further increase the contact between diesel fuel and the catalyst and hydrogen. Preliminary tests suggest that this combination could improve the catalyst activity by a factor of three. While this technology is still under development in the laboratory, the vendor is optimistic that it will be commercially available by 2006.

Diesel desulphurisation technology improvements extend beyond the desulphurisation catalyst. A high quality distributor for distribution of the liquid feed over the catalyst bed is necessary to maximize the desulphurisation capability of the reactor. Since the final rule, IFP announced an improved distributor called EquiFlow. IFP presented a paper on EquiFlow at the National Petrochemical and Refiners Association (NPRA) Annual Meeting in March 2001. A comparison of its EquiFlow distributor to a conventional distributor shows an impressive improvement in temperature consistency both just below the top of the catalyst bed and at the exit at the bottom of the catalyst bed. The improved temperature gradients provide a sound basis for concluding that the new IFP distributor would 1) improve the distribution of the liquid thus avoiding channeling around the catalyst bed, and 2) reduce hot spots in the reactor thus improving diesel fuel color and avoiding unnecessary coke build up in the catalyst bed. This

distributor as well as other improved distributors that are already available provides refiners an important array of options for meeting the 15-ppm sulfur target.

G. Emerging Technologies

The HD 2007 rule also contained brief descriptions of developmental diesel fuel desulphurisation technologies that may serve as alternatives for meeting the 15-ppm sulfur standard if they are proven successful. Linde Process Plants Incorporated and Process Dynamics Incorporated announced one such diesel desulphurisation technology in early 2002. This process is also a fixed bed desulphurisation technology using conventional desulphurisation catalysts, but it incorporates a significant amount of product recycled back to the reactor feed as the means to overcome the hydrogen mass transfer limitations which normally plague conventional fixed bed diesel desulphurisation. Operating closer to the kinetic potential for desulphurisation, this process is capable of space velocities an order of magnitude greater than those using conventional fixed bed desulphurisation. Thus, capital costs are significantly reduced and cycle lengths are extended. The Linde and Process Dynamics engineers also explained to EPA that a current highway diesel fuel desulphurisation unit revamped using this technology would recover the incremental operating costs of this added unit through improved reaction heat recovery, thus incurring a small payback. This process is being installed in a U.S. refinery with an expected start-up in the summer of 2002. If the commercial demonstration unit performs as well as the pilot plant data suggests, it could provide a much lower cost option for meeting the 15 ppm sulfur standard even in 2006.

Another technology is the Phillips S-Zorb process that has been demonstrated in a laboratory, and more recently in a pilot plant. The S-Zorb process works by adsorbing the sulfur molecules of the hydrocarbon onto a catalyst that then cleaves the sulfur molecule from the hydrocarbon molecule. To avoid saturating the catalyst with sulfur, the catalyst is constantly removed from the reactor and regenerated.

Petrostar and UniPure have developed another type of technology that chemically oxidizes and extracts sulfur from diesel fuel. Both the Petrostar and UniPure processes have been demonstrated in the laboratory, and the Petrostar process has been demonstrated in a pilot plant.

Although the emerging technologies are unnecessary for refiners' compliance in 2006 since extensions of conventional technology can meet the 15 ppm sulfur standard, they may offer lower costs for some refiners, particularly those that are able to delay production of 15 ppm sulfur diesel fuel until 2010 by taking advantage of the program's flexibilities. Based on EPA's conversations with these technology vendors, some of these technologies may require an upstream

desulphurisation unit for removing the bulk of the sulfur in diesel fuel; thus, they would likely be installed in series as a revamp to an existing conventional diesel fuel hydrotreater. An exception to relying on revamps is that Petrostar may be able to adapt its pre-extraction technology to meet the 15 ppm sulfur standard from high sulfur untreated feedstocks, and UniPure is working on adapting its process for higher sulfur feeds. These technologies consume little or no hydrogen, which provide an operating cost advantage, especially to those refiners short on hydrogen. This quality also makes these processes excellent candidates for reprocessing off-specification distillate that is generated as a result of pipeline shipment and tank storage cross-contamination. Therefore, if installed at terminals, these alternative processes could play an important role in helping to maintain the integrity of highway diesel by reducing the volume of highway diesel fuel that is downgraded to other products.

MEMORANDUM

To: Clean Diesel Independent Review Panel Members
CC: Margo Oge, Chet France, Mary Manners
From: Rich Kassel, NRDC; and Paul Billings, ALA
Date: July 17, 2002
Re: Comments on EPA's Highway Diesel Progress Review

Introduction:

The Natural Resources Defense Council (NRDC) and the American Lung Association (ALA) are pleased to provide our comments and views to the members of the Clean Diesel Independent Review Panel (the "Panel") on the above-referenced EPA report, "Highway Diesel Progress Review," EPA 420A-R-02-016 (June 2002) (the "Report").

The Report provides a series of critical insights into the rapid pace of technology investment, development and progress towards meeting the standards and goals established by EPA in its 2007 highway diesel rule (the "2007 Rule"). Coming on the heels of the recent decision of the United States Court of Appeals for the D.C. Circuit, which strongly upheld EPA's regulatory process in finalizing the 2007 Rule, the Report confirms that the diesel engine and fuel industries are on a solid path towards meeting the deadlines and standards of the 2007 Rule.

Achieving these deadlines and standards, of course, is of the utmost importance. When fully implemented the 2007 Rule will save more than 8,300 lives every year, and avoid hundreds of thousands of cases of chronic bronchitis, acute bronchitis, asthma attacks and cases of respiratory symptoms in asthmatic children annually.

This memorandum will outline our comments on the Report, covering the progress and outstanding issues facing the four issues that the Panel has been charged to address, i.e., (1) NOx adsorber technology; (2) catalyzed diesel PM filters (CDPFs); (3) refiners' plans for introducing ultra-low sulfur diesel fuel; (4) sulfur.

NOx Adsorbers:

The Report finds that progress towards developing NOx adsorbers that are capable of meeting the 2007 Rule's NOx standard is continuing at a rapid pace, and that every company believes that the 2007 NOx standard will be met. Given that full, industry-wide compliance with this standard is not required until 2010, this is a critically important finding.

EPA's finding of considerable NOx adsorber progress is the 2007 Rule's most important success story, and it illustrates the rapidity and success of the technology race that is happening throughout the diesel engine, vehicle, emission control and related industries now. This race is happening because of the certainty provided by the standards

and timetables of the 2007 Rule, as the Manufacturers of Emissions Control Association and others have pointed out.

EPA's finding is also important because it is based on the most comprehensive industry review to date—including meetings with more than twenty companies, review of confidential business information at many of these companies, in-house emissions and other testing, and review of analogous light-duty vehicle equipment.

Certainly, there are unresolved issues that remain to be resolved. The Panel has identified four areas that require further consideration: (1) broadening the temperature window; (2) improving catalyst efficiencies; (3) addressing long-term durability issues; and considering practical issues like packaging constraints and fuel economy impacts. In each case, the Report and Panel discussions (as well as information from various Department of Energy programs) have illustrated that significant progress is being made.

NRDC and ALA are extremely encouraged and impressed by this progress, especially given the short time window since December 2000 and the relatively long lead-time between now and full implementation of the 2007 Rule in 2010.

Catalyzed Diesel Particulate Filters (CDPFs):

The Report is clear that CDPFs are another success story: transit buses, school buses and other diesel vehicles are being retrofit with CDPFs and other particulate filters throughout the nation, and are being used throughout Europe and elsewhere. Most impressively, the International Truck and Engine Company has certified a CDPF-equipped engine at the 2007 PM standard (as well as the 2007 hydrocarbon standard), assuming the use of diesel fuel containing no more than 15 parts-per-million (ppm) sulfur.

In most on-road applications, CDPFs are extremely successful in reducing PM, assuming low sulfur diesel fuel is used. In New York City, where both NRDC and ALA have worked to reduce emissions from the nation's largest transit fleet, the success of the Metropolitan Transportation Authority's program to retrofit more than 3,000 diesel buses with PM filters is obvious to anybody walking up Madison Avenue on a hot July day.

Since the Rule was finalized (and since the New York MTA began its retrofit program), many important improvements in soot regeneration, dealing with oil ash, and reducing exhaust restrictions (e.g., from exhaust backpressure) have been occurring. These are important steps towards the widespread use of CDPFs in 2007, and they are well documented in the Report. Panel discussions (e.g., by MECA and Corning) have highlighted these ongoing improvements to CDPFs even further.

NRDC and ALA are extremely impressed with the pace and success of CDPF development. Further, it is clear that Panel members share our views. In sum, we expect CDPF to be used successfully to meet the 2007 PM standard—in all likelihood, well before the 2007 deadline, especially if 15-ppm sulfur fuel becomes more widely available

before then.

Refiners' Plans for 15 ppm Fuel by June 2006:

The Report and the Panel's discussions have shown that the technology needed to desulfurize diesel fuel to 15-ppm sulfur is well understood and will produce compliant fuel. In fact, companies like BP and Tosco are already committed to the widespread, early introduction of 15-ppm fuel. Other companies are providing low-sulfur fuel to fleets for their retrofit and other emission reduction programs in some metropolitan areas (e.g., Sprague Energy in New York). Nevertheless, other industry members have fought the fuel components of the 2007 Rule, including challenging them in court. Notwithstanding the foregoing, the Report finds that the refining industry is where EPA anticipated it to be, roughly four years before the first mandatory sales of 15 ppm sulfur fuel. As with NO_x adsorbers, there remain some important questions to be resolved (e.g., whether to revamp or replace existing hydrotreaters). However, no Panel member has challenged the basic EPA conclusion, i.e., that the technology to desulfurize diesel fuel to 15 ppm currently exists.

New or improved desulfurization technologies:

While it is clear that the technology to desulfurize diesel fuel to 15 ppm exists, it is also clear that advances in conventional technologies could reduce the cost of complying with the sulfur standard of the 2007 Rule. The Panel members and the Report have identified three major areas worthy of future consideration: (1) incremental improvements in current catalyst technology, (2) significant improvements in the coatings used on catalysts, and (3) improvements on the substrate used with catalysts.

ALA and NRDC are optimistic that these advances will improve catalyst performance and the emerging technologies could prove valuable to many refiners who will be investing in desulfurization technologies, especially those small refiners that can delay implementation under the flexibilities provided in the rule.

July 24, 2002

Ms. Mary Manners
U.S. Environmental Protection Agency
Assessments and Standards Division
2000 Traverwood Drive
Ann Arbor, MI 48105

Re: EPA's *Highway Diesel Progress Review* (EPA420-R-02-016/June 2002)

Dear Ms. Manners:

The refining industry members, assisted by other industry personnel with expertise in varied disciplines, have carefully assessed and evaluated the Highway Diesel Progress Review (The Review). As members of the Clean Diesel Independent Review Panel (CDIRP), we look forward to working with EPA, the other members of the CDIRP, and all affected stakeholders to conduct a thorough, science-based review of the technological and practical implementation issues for highway diesel fuel. All stakeholders have an interest in the smoothest possible implementation of the fuel provisions of the 2007 Highway Diesel program and regulations. We are therefore enclosing our comments on The Review, as requested, for inclusion into the proceedings of the CDIRP.

These remarks and observations outline the challenge facing us due to the complexity of the integrated system of production, storage, supply and distribution of ultra low sulfur diesel fuel. While this effort and these comments should be analyzed and viewed in their totality, there are several areas that require special notice and attention. None of the issues presented here is currently a "showstopper" for the highway diesel regulation, although several of these issues have the potential if unaddressed to become showstoppers. Through early recognition of these serious issues and combined efforts to ensure that they are properly addressed, implementation problems can be minimized and the introduction of ULSD for highway vehicles can transition smoothly.

One such area is that of fuel sulfur detection and testing methodology—the lynchpin of programmatic compliance. The refining industry has grave concerns that the EPA approved sulfur test method falls well short of required levels of precision. A more precise test method should be designated. Further, and along similar lines, there is a real need for in-line sulfur testing technology for pipelines that today simply does not exist. The owners and operators of the vast product pipeline systems will require such sulfur testing equipment that can operate at widely dispersed pipeline facilities and provide rapid results. Monitoring the sulfur content of product in a flowing line has not been necessary previously, and fast, accurate field equipment is not currently available. The Review is silent on these key aspects of successful implementation.

In addition and regardless of possible technologic requirements or advancements, good business practice requires that most if not all relevant information be analyzed before committing to certain approaches. Included in this critical information, and yet unknown at this time of planning and decision making for the refining industry, are the looming non-road diesel sulfur requirements. Sulfur levels and compliance dates for non-road diesel are data points that must be part of the equation in order to make informed decisions. However, the appropriate sulfur levels and targeted compliance dates for non-road diesel fuel must be established employing valid criteria including, among others, actual need, the inter-relationship with other fuel parameters and regulations, and the total impact on supply and price in the marketplace. Also, there is a valid need to make the sulfur credit trading system and its related provisions more flexible to assure liquidity and fully understand the impact on the overall diesel market—supply and availability of sufficient product.

Future EPA progress reports need to verify that the volumes of ULSD and LSD reaching truck stops and other fueling facilities match today's volumes and anticipated growth in highway diesel demand. EPA must ensure that ULSD and LSD production at refineries is sufficient to offset all downgrades to HSD and new losses to interface/transmix. EPA should take two important steps to address and understand the supply issue: 1) Consider the entire diesel pool, not just highway diesel, and 2) Understand that planning for compliance may well include shut down of refineries or otherwise abandoning the highway diesel market.

Again, we fully expect our comments to be considered as a total package and these are but a few illustrations of the many issues the refining industry believes require significant attention by the CDIRP and EPA. The CDIRP process is well suited for exploring these issues and they require proper consideration in order to ensure the most-effective implementation process possible for the 2007 Highway Diesel Rule. If the CDIRP does not address these issues, it should, as a minimum, document these issues and direct EPA to develop an appropriate forum to ensure that these issues are addressed.

Sincerely,

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Comments of

**BP America, Inc.,
Gary-Williams Energy Corporation,
Marathon Ashland Petroleum LLC,
Wyoming Refining Company,
The American Petroleum Institute,
The Association of Oil Pipe Lines, &
The National Petrochemical & Refiners Association**

To the

Environmental Protection Agency

Regarding

**The Highway Diesel Progress Review
(EPA420-R-02-016/June 2002)**

These comments are in response to EPA's request that members of the Clean Diesel Independent Review Panel (CDIRP) submit written comments about EPA's *Highway Diesel Progress Review (EPA420-R-02-016/June 2002)*. We were specifically asked to address whether any relevant information was omitted or included inaccurately. We were also asked to note what related issues, if any, are not covered in the report or in the panel charge and to suggest mechanisms or forums through which they might be addressed.

In order to gain the insights of other refiners, pipeline operators and terminal operators, the refiner members of the Clean Diesel Independent Review Panel have enlisted the assistance of API, AOPL and NPRA in producing comments on this report. We are pleased to provide the following comments, per EPA's request. We represent virtually all U.S. refiners and pipeline operators that produce and transport distillate fuels for highway and non-road engines and heating and have a large stake in the implementation of the 2007 Highway Diesel Rule.

I. INTRODUCTION

Two key factors provide the framework for this response:

1. The progress review itself is a detailed and professional summary of information compiled by or submitted to EPA since adoption of the diesel rule. It reflects EPA's effort to

communicate with stakeholder companies and to assess the extent to which those companies are on an appropriate compliance schedule.

2. The charge to the panel and the subject matter of the progress review are focused on, and limited to, specific technological questions, apparently to determine whether the refining technology required to produce ultra low sulfur diesel is commercially available. As a result, other questions critical to the production and distribution of adequate low sulfur fuel relating to systems management, logistics, economics and other non-technology matters are not addressed. Technology is not the only barrier that must be overcome to accomplish the fuel-related goals of HD 2007.

We want it to be clear that we have no intention of “trying to reopen the rule” to change any substantive element (sulfur level, timing). Our interest – and that of others in the refining and pipeline industries – is, as requested, to note related issues not covered in the EPA report or in the panel’s charge and to explain briefly why these issues are, in fact, critical to the successful implementation of HD 2007. There will be no room for surprises related to ULSD supply, distribution or consumer price once 2006 arrives.

It is still early in the refining industry’s decision-making process. Large refining companies are still reviewing the cost effectiveness of revamping all their facilities to comply by June 2006. Most small refiners are not only looking at technologies available today but are also hoping that desulfurization projects actually implemented by the majors will provide useful information about what works most effectively and at what cost. Few refiners have the resources to take any risks with emerging technology. While, as the report notes, diesel desulfurization refining technology is available and improving, individual refining industry members, by and large, have not yet made their decisions of which options, e.g. – committing to a technology, closing facilities, moving to the off-road market, exporting non-ULSD or a combination of these or other options, make the most economic sense for their companies, for a competitive industry and, therefore, for the consuming public.

There is little to argue with in the preliminary data included in the EPA progress review.¹ They draw on public and confidential information and indicate that strategic planning is proceeding on EPA’s anticipated timeline. **As a result, the report leaves too much room for and, perhaps, even invites a potentially misleading inference; namely that all significant problems concerning the fuel implementation aspects of the HD 2007 program are being adequately addressed.**

There are numerous issues surrounding implementation of the rule that have not been addressed at all in the report and that must be considered if EPA is to make a fair assessment of

¹ One small refiner has noted a correction in the report. The review states that Frontier Refining Company plans to produce 15 ppm diesel at its El Dorado, KS facility in 2006 and to delay 15 ppm diesel at its Cheyenne WY facility until 2010. Frontier has concluded that supply and distribution constraints will probably be such that delaying Cheyenne compliance may not be viable. Frontier has notified EPA of its intent to produce 15 ppm diesel at both refineries and extend Tier 2 gasoline compliance until 2011.

progress towards introduction of ultra low sulfur diesel. The full set of issues we have identified are included in the table below and are addressed in our detailed comments.

Issues Addressed In These Comments	
Refinery Issues	<ul style="list-style-type: none"> Non-road Diesel Requirements Undefined Desulfurization Technologies Distribution of ULSD Within Refineries Sulfur Test Method Potential Credit Trading Program Problems Small Refiner Concerns
Pipeline Issues	<ul style="list-style-type: none"> In-line Sulfur Detection Needed Downgrade Volumes Product Sequencing Other Sources of Contamination 20% Downgrade Limit Breakout Tankage Disposition of Downgraded ULSD Pipeline Specification
Terminal Issues	<ul style="list-style-type: none"> Additional Tankage For LSD Segregation New Tankage Requirements For ULSD Interface/Transmix Necessary Changes To Minimize Contamination and Downgrades Disposition of Downgraded ULSD Volumes Dependable Sulfur Field Test Method Needed At The Terminal
Marketing Issues	<ul style="list-style-type: none"> Preventing Misfueling How Will Truck Stops Handle Two Grades of Diesel
Supply Issues	<ul style="list-style-type: none"> The Importance of LSD Production and Distribution EPA Needs To Look At The Entire Diesel Pool

II. REFINERY ISSUES

a. NON-ROAD DIESEL REQUIREMENTS ARE STILL UNDEFINED AND WILL NOT BE FINALIZED FOR ANOTHER 1 ½ YEARS

While there is certain logic from an engine perspective to EPA's sequential approach to dealing with Highway diesel engines and fuels before dealing with Non-road diesel engines and fuels, from a refinery point of view this piecemeal approach doesn't work. Most refineries make both highway and non-road diesel fuel. EPA's sequential

approach means that these refineries will not have complete information for planning and economic decision making until the end of 2003. However, in order to produce 15 ppm sulfur highway diesel fuel by mid-2006, refineries should begin planning and economic decision-making by mid-2002.

Refinery desulfurization facilities are not modular and the economic costs are not linear. Building a 70% sized unit now and 30% sized unit four years later may result in total costs that are 50% higher than building a 100% unit now. Good business practices require comparing the extra costs of building a larger unit early versus the value of delaying some portion of the costs for several years. Refiners need to know the required sulfur levels and the timing for all portions of the distillate pool that need to be desulfurized.

Since refiners will not have information on the non-road diesel requirements in time to make their economic decisions, they must make risky guesses about non-road diesel sulfur levels and timing. Paying for the desulfurization investments will require 3-7 years of typical annual cash flow. The conservative approach would dictate that the minimum investment to meet the known highway diesel regulations be made at the present time and that the investment in the unknown non-road diesel desulfurization be delayed until those requirements are known and the additional investment can be justified. However, taking this conservative approach results in greater costs, particularly for non-road diesel desulfurization. This does not mean that the non-road diesel requirements need to be implemented sooner. Refiners need the knowledge about when and how much sulfur to remove.

The implementation date for non-road is best set from a refining point of view when it has the least impact on the highway diesel fuel regulatory implementation and its potential supply problems. Therefore, EPA needs to finalize the non-road diesel sulfur requirements as soon as possible. However, the appropriate sulfur levels and targeted compliance dates for non-road diesel fuel must be established employing valid criteria including, among others, actual need, the inter-relationship with other fuel parameters and regulations, and the total impact on supply and price in the marketplace.

b. HYDROTREATING FOR ULSD

Diesel fuels are formulated from various refinery streams, including production from conversion units and virgin feed stocks. At the sulfur levels found currently, the diesel pool contains light cycle oil (LCO) from FCC units that may require further hydrotreating, diesel products from hydrocracking units, some virgin diesel, and hydrotreated coker and virgin distillates. Each of the streams contains numerous types of sulfur compounds, each ranging in its ability for processing from simple, to immensely difficult refractory species.

There are a number of reliable methods for the production of ULSD within a refinery. These include hydrocracking of vacuum gas oils (VGO) to produce a primary

ULSD product, partial conversion of FCCU feeds, and simple hydrotreating. However, the primary method will be the use of hydrotreating technology. When the diesel sulfur target became 500 ppm, many refiners loaded more active catalyst in their existing hydrotreaters, or performed minor revamps. This modification resulted in production of similar quantities of hydrotreated diesel fuel and afforded the opportunity to blend many of the marginal streams directly. As a result, the hardest to treat components/streams were often dedicated to production of non-road diesel fuels.

As refiners look to consistently produce ULSD, it will be necessary to treat all of the components of the ULSD diesel pool. Practical and economical decision making suggests the first alternative that most refiners will investigate is reconfiguration (revamps) of existing assets. During the last era of revamps (those required to produce <500 ppm diesel), refiners added hydrogen during the relatively mild desulfurization step. They observed either a negligible loss of diesel yield, or in some cases, a slight increase in diesel volume due to swell as hydrogen was added. To produce ULSD, the severe hydrotreating that will be necessary will result in much higher hydrogen requirements accompanied by significant yield loss – perhaps in excess of 2%. This volume loss occurs as the severity of the hydrotreating unit increases and some cracking of the distillate to lighter components results. To conserve capital and/or utilize existing assets, some refiners are also opting to remove the heaviest portion of the diesel from pool. This heavy portion could represent 3-5% of the distillate pool based on a 1996 survey of average distillate properties. While each refinery will have a different quantitative impact, the overall effect will be significant and larger than the processing yield loss noted above.

In situations where a revamp will not satisfy the diesel demand or new sulfur specifications, a refiner will undoubtedly evaluate several alternative new unit-processing options—hydrotreating being the primary candidate. In selecting the design criteria for a new hydrotreater, a refinery must consider the amount of diesel they want to produce, as well as the ability to process the feed components. The more difficult to process feeds require units that have larger catalyst volumes or that operate under more severe conditions (pressure and/or temperature.) With proper design yield losses can be minimized. However, no matter which diesel hydrotreating unit a refiner elects to construct, there will be yield losses, incremental processing costs and significant capital requirements.

A refiner must further include excess capacity in the unit design to have the capability of reprocessing off spec diesel. Previously, off spec material could be managed by slowly blending it back into the pool. The stringent ULSD specs prohibit this practice. In addition, both planned and unplanned downtime of the new hydrotreater or other diesel processors in the refinery must be accommodated. In new units refinery planners are including an additional 5 % for downtime and 5% (or more) for off spec processing. In many cases, this added 5 + 5 is not simply for the new unit, but for an entire refinery diesel pool. If a refinery does not have the capacity to make up for lost or off-spec production, the additional volume will disappear from the market.

When analyzing the ability to process various feedstocks, a refiner must consider several additional factors, each having implications for total yield/loss. One option is to take the harder to process materials and treat them to a higher sulfur level for use in the off-road diesel pool. This option is, however, dependent on off-road diesel fuel sulfur regulations—at this time uncertain. A second option suggests cracking high sulfur aromatic diesel materials in an existing hydrocracking unit to produce gasoline. If this diesel replaces VGO feedstocks to the hydrocracker, the direct impact would be a loss of available diesel to the pool.

EPA must assess the likelihood of significant product yield loss resulting from application of hydrotreating (and other) technologies and strategies and the implications on the overall supply of diesel fuel.

c. DISTRIBUTION OF ULSD WITHIN REFINERIES

1. INCREASE IN NUMBER OF DISTILLATE PRODUCTS

Currently there are two grades of distillate that must be moved through the refinery – distillate capped at 500 ppm sulfur and 2000+ ppm sulfur product. If a refinery is to take advantage of the temporary compliance option (TCO) allowing for an 80/20 split of 15 ppm to 500 ppm sulfur diesel, a third grade is introduced. This has significant implications beyond hydrotreating capacity/capability because of the need for additional tankage, piping and other improvements needed to move and store product at the refinery.

2. CONTAMINATION CONCERNS INSIDE THE REFINERY

Many refineries do not have segregated distillate systems to move product to shipping tanks and loading docks. There are only two viable alternatives to deal with ultra low sulfur distillate. Both result in significant cost and/or logistical concerns. The first is to set up a segregated, dedicated system for each grade. This would require new piping and probably new tanks. The second is using the existing logistical systems in which distillate lines will always have to be laid down with ULSD resulting in significant volumes of downgraded 15 ppm product. This directly impacts the 80% requirement for 15 ppm product because the volumes of 500 ppm product will be greater, thus reducing the utility of the TCO.

3. DELAYS FOLLOWING TURNAROUNDS AND UNPLANNED UPSETS

Most refineries will likely produce higher sulfur distillates during turnarounds and upsets so that it will be necessary to flush the logistic system before resuming ULSD production. This will result in delays in production of ULSD following such periods and increased volumes of ULSD downgraded to higher sulfur distillates.

d. SULFUR TEST METHOD

EPA chose ASTM D 6428-99 as the designated test method for measuring sulfur content in 15 ppm diesel fuels. Two alternative test methods -- ASTM D 5453-99 and ASTM D 3120-96 -- are also allowed provided that the refiner or importer test result is correlated with the designated method. ASTM undertook an extensive round robin program including 39 oil industry laboratories, 13 instrument vendor labs, and 4 independent labs. Sixteen diesel samples were sent to these labs to be measured on four ASTM sulfur test methods, including D-6428, D-5453, D-2622 and D-3120.

The ASTM round robin results show that ASTM D 6428 is the least precise of the four methods for both repeatability and reproducibility. In fact, for the compliance level of interest for 15 ppm diesel fuel, the uncertainty level for the measurement is 16 ppm! This suggests that a refinery blender will need to produce batches of diesel fuel measuring zero sulfur in order to be sure that the batch leaving the refinery is compliant with the 15 ppm standard. Parties located downstream of the refinery will likewise be saddled with a very imprecise measuring tool. Although the final rule does allow for a 2 ppm adjustment factor being applied to downstream sulfur measurements to account for test variability, the 2 ppm is not nearly enough to address the large test variability reported by the ASTM round robin program. In contrast, D-5453 has a reproducibility precision of 6 ppm and would be a more appropriate choice as the regulatory test method.

The consequences of having a designated test method with inadequate precision for diesel fuels is that the refiners will need to blend to extremely low levels of sulfur on every batch, which translates into large additional costs. There will be high potential for increased reprocessing of batches and/or downgrading of batches that test off specification both at the refinery and downstream.

Use of an allowed (and more precise) alternative method does not help the refiner nor the downstream parties (pipelines, terminals, enforcement agencies, etc.) because the correlation back to the designated method brings with the calculation all of the poor precision of the designated test method. Based on extensive industry experience measuring sulfur concentrations, as well as the ASTM round robin results, **EPA should choose the more precise ASTM D 5453 as the designated test method.**

e. POTENTIAL CREDIT TRADING PROGRAM PROBLEMS

The intended flexibility benefits of EPA's 80/20 Temporary Compliance Option (TCO) are dependent on a working credit trading system that allows credits to easily flow between 15 ppm sulfur diesel producers and 500 ppm sulfur diesel producers. In order for a credit trading system to properly function, it must have liquidity. This means that there must be sufficient credits generated to meet the demand for credits and there must be a sufficiently large volume of credits traded that an efficient market with stable values can take place.

If the intent of the TCO is to permit some refiners to stage capital investments and therefore allow for technology to mature before the final units are installed, then significant modifications to the program should be considered. Paramount to this objective would be early credit generation. The TCO should allow for credits to be generated early enough in time to permit the refiner who chooses the course of delaying capital projects to have secured title to credits well in advance of the alternative's deadline. Basically, the credit program would need to begin no later than 2004 to meet this objective. The earlier, the better—for both the environmental initiatives and the motor fuel manufacturer.

The functionality of the program as it is written today is limited to primarily a risk management program where refiners could utilize credits on a short-term basis. This method of utilization will likely permit refiners to extend hydrotreater run lengths, and more controllably shutdown facilities for maintenance purposes. As for an element in long-term strategic plans, the current program contains far too many uncertainties for refiners to utilize the limited options.

1. PADD RESTRICTIONS

In its efforts to make sure that ULSD is adequately available everywhere in the country, EPA has placed PADD restrictions on its credit trading programs. These restrictions significantly reduce the volume of credits that can be traded in each of these PADD credit trading programs compared to a national credit trading program. The result may be that several PADDs do not have a sufficiently liquid market to entice participation. Without sufficient participation, the PADD credit trading system will not function and the 80/20 TCO will not provide the intended flexibility.

In addition, within some PADDs, such as PADD IV, the distribution system does not and/or will not allow for sufficient movement of 500 ppm diesel for the 80/20 ratio to be attained. There is little chance that a limited credit trading system will work in these areas.

Infrastructure remains the single biggest challenge to the ULSD TCO program. The delivery of a wet barrel of product to the consumer at every regional retail fueling point is a requirement that places significant challenges on the nations supply and distribution abilities.

EPA should remove the PADD restrictions from its credit trading system. In reality, the PADD restriction does very little to ensure widespread distribution of ULSD. Consider that the intent is to evenly distribute ULSD over the entire nation assuring the proper fuel for the 2007+ year model engines, yet the program is administered at the refinery level and in a way that oversupplies ULSD in the early years. Given the importance of a workable credit trading system, it is best to err on the side of ensuring that the credit trading system will work.

2. LACK OF CREDIT FOR STATE DIESEL PROGRAMS

Over and above the potential problems created by the PADD restrictions, EPA has created additional restrictions by refusing to grant credits for ULSD produced as part of state diesel programs. This makes little sense, since the ULSD that EPA desires is being produced. Of particular concern is the possibility that ULSD produced in Texas may not qualify for credits. This may be sufficient to undermine any credit trading program in PADD III.

EPA should remove the credit restrictions for state ULSD.

f. SMALL REFINER CONCERNS

Many small refiners may not be able to take advantage of the diesel rule provisions intended to help them. One small refiner compliance option is to continue producing 500 ppm highway diesel until June 1, 2010. This option is available only if the small refiner can demonstrate that sufficient sources of 15 ppm diesel exist in the market area. The 15 ppm and 500 ppm on-road fuels must be segregated throughout the distribution system. Even though in a few situations the 500 ppm option may mitigate the impact of diesel compliance, it is not a panacea and creates other serious problems for small refiners. Those considering the 500 ppm option must decide using inadequate data.

Unfortunately, it does not appear that information necessary to assess and take advantage of EPA's small refiner options will always be available to answer questions such as the following: Given the fact that 15 ppm fuel must be available in the same geographic market as 500 ppm fuel and will be suitable for both new and older model trucks, will the 500 ppm fuel have to be sold at discounted levels compared to the 15 ppm variety? Will producers of the 15 ppm fuel offer their product at prices equal to or lower than those relying on the 500 ppm strategy in order to increase market share? Will small refiners producing 500 ppm fuel be able to get their product to the marketplace given the fact that the pipeline distribution system is likely to handle only the single 15 ppm fuel? In short, if a refiner cannot sell it or get it to market, what is the purpose of producing it? When the additional uncertainties of non-road markets associated with the anticipated rulemaking are added to the mix, the small refiner is left with potentially more conflicting information and choices.

In PADD IV, for example, the pipeline distribution system accepts only diesel meeting on-road sulfur standards. No diesel exceeding on-road sulfur standards is shipped in the PADD IV pipeline system. Therefore, refiners opting to produce 500 ppm fuel will be limited to on-road and off-road customers reachable by truck assuming refining margins allow a price discount that offsets the cost penalty of truck transportation.

Complicating matters is the fact that small refiners, most of which operate west of the Mississippi, have limited alternatives because there is usually no viable home heating oil market in the region.

The small refiner must address all of these questions before 15 ppm diesel enters the market or risk producing 500 ppm fuel for which there very well may be no market at all. EPA plans to issue annual summaries of the pre-compliance reports required of refiners from 2003 through 2005. It is unlikely, however, that these reports will provide adequate or sufficiently timely data to enable reliable analysis of future off-road or 500 ppm fuel market viability. In short the distribution system and marketing concerns discussed later in this report undermine the usefulness of the small refiner 500 ppm option.

Conversely, a small refiner may elect to construct a desulfurization project, produce ULSD before June 2010 and receive credits for producing some or all diesel at 15 ppm. This refiner, however, will be back at square one, facing the same financing, engineering, construction resource and equipment availability problems that prompted the small refiner diesel provisions in the first place. While credits, once produced, may have future value for the small refiner, the prospect of producing future credits has no present value that can aid in project financing. Admittedly, small refiners could benefit from the 2-3 year delay in implementing Tier 2 gasoline requirements they could obtain through this option. It is highly unlikely that small refiners will have the financial stability or survival prospects necessary to attract long-term commitments for the purchase of future credit production and, therefore, to access loans payable from future credit sales.

III. PIPELINE ISSUES

a. IN-LINE SULFUR DETECTION EQUIPMENT WITH FAST TIMING IS NEEDED.

Pipeline operators need in-line sulfur testing equipment that can operate at widely dispersed pipeline facilities and provide rapid results. Monitoring the sulfur content of product in a flowing line has not been necessary previously, and fast, accurate field equipment is not currently available.

The industry needs a device that will find contamination that may have happened to the ULSD batch before receipt into the pipeline or while in transit to allow for corrective action before off-specification material reaches any tanks, including breakout and truck terminal tanks. There are many opportunities during transit for a batch of ULSD to inadvertently become contaminated with a small "spot" of higher sulfur product. This is an isolated problem until the batch enters a tank, blends with the clean product already there, and possibly renders the whole tank off-spec.

The same in-line equipment is needed to help define cut points. Pipelines currently make almost all cuts by density or "gravity". Sulfur content changes typically occur before any noticeable changes in gravity or appearance. Depending upon the adjoining batches, there may be no gravity change at all. The ability to monitor sulfur content is the only sure way to protect the ULSD, and without this tool pipelines will be forced to downgrade a much larger percentage of ULSD to protect the sulfur level.

The EPA should monitor the progress on the development of in-line sulfur detection equipment and be prepared to make major modifications to refinery vs. downstream specifications (e.g., the 20% downgrade limitation) should no acceptable in-line instrumentation be forthcoming.

b. WHAT IS THE EXPECTED VOLUME OF ULSD INTERFACE THAT WILL BE DOWNGRADED?

The length of interface in a pipeline is dependent upon the distance traveled, pipe diameter, velocity and viscosity. Shutdowns also cause interfaces to grow.

Limited industry testing indicates that ULSD interfaces should be similar to current critical interfaces (for example a gasoline to distillate interface). Interface properties are not linear but vary geometrically from one product to the next. That is, there is really no end to the interface, just a point at which the accuracy of the measurement of the variable indicates it has stopped changing. It is the difference in the properties and ratio of this difference to the allowable specification that governs where the cut must be made. Traditionally, pipelines have made cuts based on properties such as flash, vapor pressure, or dye content. In most instances, gravity was used as a surrogate for the property of concern. Cuts requiring less than 1 part in 20 down to 1 part in 100 are the norm. In the case of dye, visual observation is typically used. Dye is also the current property that typically requires the cleanest cut, with the visually detectable limit at about 0.03 ppm. Dyed off-road distillate may contain 11 ppm dye. This is a ratio of 367 to one.

The sulfur tolerances will be even tighter. Much of the off-road product will be 2000 ppm. Pipelines will probably have about 2 ppm of “slack” between refinery production and terminal requirements. This is a ratio of 1000 to one and the ratio would be even worse for kerosene or 0.5% sulfur fuels. This is clearly uncharted territory for the pipeline.

The cut becomes particularly complex when one property requires a cut at one point and another property requires a cut at another point. The product that ends up with “nowhere to go” becomes transmix.

Since ULSD will likely be buffered with higher sulfur material, handling procedures will require protective cuts with an additional downgrade safety factor to protect sulfur content. The amount of interface generated will increase under the rule. Each system will need to be analyzed individually to determine the amount of interface that will be generated and the batch sequences that will result in the least interface.

At a minimum, we can expect the amount of product downgraded to equal the amount of gasoline/distillate transmix created today, thereby doubling the amount of fuel that is refined but unmarketable. All this downgraded fuel takes up space – in pipelines and in tankage.

The EPA should encourage pipeline operators to perform ULSD tests and to share information among the industry to determine the amount of interface that will be generated and to test the batch sequences that will result in the least interface. This will require refiners to produce test batches.

c. PRODUCT SEQUENCING AND THE REQUIREMENT FOR HIGH SULFUR FUEL

To protect the flash point of the jet fuel (and thus its safe use), interfaces between batches of jet/kerosene fuel and diesel are traditionally cut protectively into the diesel. However, ULSD will be contaminated by such an addition of the higher sulfur product. Thus, jet/kerosene and ULSD can accept no interface. They cannot be sequenced together unless the interface is cut out as transmix and either added to high sulfur pool or desulfurized by reprocessing plants, a process not now available. In addition to these difficulties at the destination, a jet/kerosene/ULSD interface would create unusable product during switches between tanks of one shipper and another at the origin location where pipelines connect, or a pipeline connects with another transportation mode. Neither operations, piping or tankage is set up to accommodate any product removal at the origin. The only solution is to sequence gasoline or high sulfur fuel oils between them.

Sequencing gasoline between distillates could result in a minimum 4-fold increase with a maximum 8-fold increase in transmix if separate gasoline and distillate lines were currently in service.

The sequencing of high sulfur product between the jet/kerosene and ULSD is the only proven solution. However, this creates a requirement to always move high sulfur products. The demand for high sulfur fuels is based on seasonal requirements, so portions of the year the shipment volume of high sulfur fuels may be low or zero.

d. OTHER SOURCES OF CONTAMINATION

Higher sulfur products easily contaminate ULSD. Each pipeline system will have its own “personality”. Anything that creates a product quality problem today will be exacerbated when handling ULSD. Potential sources of contamination in pipeline systems include:

- Slow actuating valves
- Non-dedicated tank lines
- Long dead-legs in stations
- Leaking valves
- Long suction/discharge piping at pump stations
- Sumps that inject automatically
- Prover loops that are not continuously flushed
- System operations including shutdowns

Some of these can be eliminated through redesign and upgrade. This would be costly but is doable. Others, such as slow actuating valves or system shutdowns cannot be eliminated without unacceptable reduction in pipeline safety. Pipeline operators will need to design and implement solutions to minimize contamination of ULSD batches.

The EPA should encourage pipeline operators to share information about potential contamination sources within their systems and should evaluate the impact of intractable sources of contamination such as slow actuating valves.

e. WHAT WILL BE THE DISPOSITION OF DOWNGRADED ULSD VOLUMES?

If LSD or HSD tanks are available at breakout storage locations, downgraded ULSD volumes will be blended into these other distillates. At breakout locations where LSD or HSD tankage is not available, the downgraded ULSD will need to be segregated into new or other available tankage.

Transmix processors will be unlikely to produce ULSD from gasoline/ULSD transmix and will have to produce the distillate product as LSD or HSD. Thus, downgraded ULSD will either become LSD or HSD on site or after reprocessing but will NOT be recovered as ULSD.

The EPA should work with operators of the distribution network to determine the total amount of ULSD that will be downgraded.

f. THE 20% DOWNGRADE LIMITATION FOR ULSD TO LSD MAKES NO SENSE

The special rule for the phase-in period, limiting the amount of ULSD that can be downgraded to LSD to 20%, increases the chance of “lockouts” caused by off-specification product.

The 20% downgrade applies to normal interfaces as well as any accidental contamination of a batch. Since interface volumes will likely increase under the rule, there may be little room to recover from the accidental contamination of a batch. Since the highway diesel regulation only allows LSD for highway use to exist for four years, it is not likely that construction of additional tanks to handle this additional product can be justified. An operator up against the 20% limitation will have no choice but to downgrade contaminated ULSD to HSD, which will eliminate it from being used as highway diesel. This limitation imposes new rigidities to an already stretched system, increasing the likelihood of supply imbalances and market impacts.

The EPA should reconsider the 20% downgrade limitation for ULSD to LSD.

g. IS ANY NEW BREAKOUT TANKAGE BEING BUILT FOR LSD SEGREGATION?

The movement of three grades of distillates – LSD, ULSD, and high sulfur fuels – through to all locations is **extremely** unlikely. Pipelines with multiple tanks in LSD service may be able to reconfigure tank use to accommodate both LSD and ULSD. Pipelines with single LSD tanks or tanks of the wrong size may need to add new tankage. Since the highway diesel regulation only allows LSD for highway use to exist for four years, it is not likely that pipeline operators will be able to justify new tankage to handle two grades of on-highway diesel.

Since ULSD will be the predominate product, breakout tankage will be forced out of LSD service at locations where tankage is not adequate. Most pipelines will likely not ship two grades of on-highway diesel to all locations serviced.

The EPA may want to consider the effect that not having two grades of on-highway diesel will have at truck stops and other fueling facilities, as well as the impact on overall diesel supply if refiners are planning on an 80/20 ULSD/LSD production ratio per the TCO, since the ability to distribute the LSD fuel to market is likely to be constrained.

h. CREATION OF PIPELINE SPECIFICATION TO ENSURE DOWNSTREAM COMPLIANCE

As pointed out in the section on Testing (II.d.), the EPA's chosen Test Method has only gone through one round robin and the resulting reproducibility was unacceptably high at +/-16 ppm. Without knowing the reproducibility of the Test Method, however, pipelines and their shippers cannot establish the necessary specification for pipeline tenders of ULSD, and without those specifications in place refiners cannot plan effectively.

In a fungible pipeline system, product specifications set the tolerances of acceptable product quality, thus assuring shippers that the delivered product will be ready for sale or use. The typical method of creating a specification is the regulatory or market standard plus the downstream enforcement tolerance (in this case 2 ppm) minus the reproducibility of the test method.

As many as 50 independent tests may be run on the product that is commingled to constitute a batch of ULSD in a fungible pipeline system. The reproducibility is a key element to help downstream parties understand the variability of their results. In addition, pipelines may also require some additional tolerance to handle interface and possible small amounts of contamination. Pipelines may require some additional sulfur allowance (lower specification) to account for some small increase in sulfur content due to operations. Actual movements and history will be the only way to quantify this issue.

Without resolution around the reproducibility of the test method, pipeline operators cannot set their specifications and refiners do not have an accurate understanding of what the production sulfur content level will be.

IV. TERMINAL ISSUES

a. IS TERMINAL TANKAGE FOR 500 PPM LSD BEING BUILT OR SEGREGATED?

Even if refineries are making sufficient desulfurization progress to ensure that sufficient volumes of ULSD are produced to meet the 80% TCO requirement, it is still necessary for pipelines and terminals to have sufficient tankage to also handle the 20% TCO allowance of LSD (500 ppm sulfur) to ensure that the full 100% of the highway diesel fuel requirements are met. **In addition to surveying refineries to track progress, EPA should also survey terminals to ascertain if sufficient tankage is being built or segregated for LSD.**

b. WHAT ARE THE EXPECTED VOLUMES OF ULSD INTERFACE/ TRANSMIX? IS TANKAGE BEING BUILT TO HANDLE THIS MATERIAL?

The movement of ULSD through pipeline systems with no HSD or LSD will result in either additional transmix creation or the creation of a ULSD/jet-kerosine interface material that must be segregated from both the ULSD and the jet-kerosine. Terminals must be able to accommodate these off spec volumes. To handle these materials, terminals will need either increased and/or new tankage. **To ensure that acceptable progress is made in this area, EPA's terminal survey should also address this tankage requirement.**

c. WHAT IS THE LIKELY DISPOSITION OF DOWNGRADED ULSD?

Under current operations, some small portion of transmix is blended in gasoline and the remainder must be sent to a transmix processor or to a refinery for reprocessing. Transmix processors will be unlikely to meet the 15 ppm ULSD specification. Thus, at a minimum the distillate portion of transmix and all ULSD/jet-kerosene interface must be moved to refineries for reprocessing or downgraded to LSD or HSD. These volumes will also contribute to the total amount of downgraded ULSD and if significant downgrading occurs it will impact the volume of ULSD that must be produced at refineries.

EPA needs to work with the pipeline and terminal industries to develop a realistic estimate of the total distribution system ULSD downgrading. This information can then be used to ensure that sufficient refinery ULSD production capability is built to support reprocessing.

d. HAVE DESIGN CHANGES BEEN MADE TO MINIMIZE CONTAMINATION AND DOWNGRADING?

Many terminals will need to redesign their manifolds, prover loops, sump discharge systems, etc. to minimize the contamination of entire batches of ULSD. **During their terminal survey EPA should ascertain that terminals have at least examined their potential sources for contamination.**

e. DEPENDABLE SULFUR FIELD TEST METHOD NEEDED AT THE TERMINAL

Product terminals are going to need to be able to check sulfur levels. , There is no field equipment available today capable of testing accurately at the levels needed. Today terminals rely on the pipelines and tests done before product is unloaded from the vessel. In the future, there may be a much greater chance of contaminating the batch as it is coming into the terminal. Some of the design changes discussed may minimize this concern, but EPA may want to investigate the potential availability of field test equipment. Unlike pipelines, terminals do not need inline analyzers but need a quick, foolproof test that can be conducted at remote locations by typical terminal personnel. If a product terminal was forced to go to an outside lab for testing, its ULSD tank could be out of business for a couple of days until the test results are received, if it only has one ULSD tank. This would not be very practical.

V. MARKETING ISSUES

EPA should examine two marketing issues: 1) the causes of and potential solutions for miss-fueling and 2) retail infrastructure improvements that may be required to provide two grades of highway diesel. We have deferred detailed discussion of these issues as we assume the marketers represented on the Panel will address these and other marketing-related issues in their comments to EPA.

VI. SUPPLY ISSUES

Market economics ensure that, in the long run, supply will match demand. However, when new regulatory fuels requirements are implemented, there have typically been short-term supply disruptions. Two recent diesel programs are examples: implementation of the EPA Highway diesel requirement for 500 ppm sulfur led to supply disruptions for several months and the CARB diesel program led to supply disruptions that lasted for more than a year. Supply disruptions have price implications. The recent FTC report on Midwest gasoline supply problems found that given the elasticity of gasoline “a decrease in supply (or increase in demand) of 5% can explain the 30 to 40 percent increase in the wholesale price.” Diesel fuel is more price inelastic than gasoline, which means even larger price impacts from supply disruptions. Diesel fuel customers view the costs of purchasing fuel as more of a business decision than does the typical gasoline customer.

In addition, the large capital requirements and the time required to make the refinery modifications to produce ultra-pure ULSD will not permit quick increases in ULSD supply. Given these realities, it is best for all stakeholders in the Highway ULSD program, if there is a close balance between supply and demand as the program begins.

Supply in this case refers not just to ULSD production but to all LSD and ULSD production. A significant portion of the non-road diesel market uses LSD today and this volume must continue to be produced to balance the demand. In addition, since ULSD will have a lower BTU value, slightly more ULSD must be supplied to provide the same transportation benefits as today's LSD.

Supply is critical not just at the producing refinery, but also at the truck stops and other facilities where the ULSD and LSD will be put into the vehicle's fuel tank. Thus supply concerns must be addressed throughout the entire distribution system and not just at the refinery. Supply losses (and gains) in each part of the distribution system from the refinery through the truck stop are additive and it is the cumulative supply impact that is of concern.

a. THE IMPORTANCE OF LSD PRODUCTION AND DISTRIBUTION

If a refinery produces an equivalent amount of ULSD and LSD to that which the LSD it produces currently, a supply shortfall can still occur if a significant portion of the ULSD must be downgraded to HSD. Note that if the ULSD is downgraded to LSD, the 80/20 ratio may no longer be maintained but that total ULSD and LSD supply can be maintained.

Since ULSD will be the predominant product, it is assumed that it will use the piping and tankage currently associated with LSD highway fuel today. However, the Highway diesel regulation creates an addition grade of diesel fuel for which no current refinery, pipeline, terminal, or truck stop infrastructure exists. Some refineries, pipelines, terminals, and truck stops may currently have multiple tanks in LSD service and these may be able to redesign these multiple tanks to handle both ULSD and LSD. However, facilities with single tanks or facilities with multiple tanks of the wrong relative sizes must build new tankage. Since the Highway diesel regulation only allows LSD for Highway use to continue to exist for four years, it is unlikely that the construction of these tanks can be justified. Without these new tanks, ULSD cannot be downgraded to LSD and there will be a shortage of total highway diesel. Note that the credit trading system could allow some of this problem to be avoided but EPA's proposed credit trading system—with its PADD restrictions and its failure to allow credits for state programs—does not appear flexible enough to be of much help in this area.

Future EPA progress reports should verify that the volumes of ULSD and LSD reaching the truck stops and other fueling facilities match today's volumes and the anticipated demand growth in highway diesel. EPA must ensure that ULSD and LSD production at refineries is sufficient to offset all downgrades to HSD and new losses to interface/transmix.

b. EPA SHOULD LOOK AT THE ENTIRE DIESEL POOL

Given the points in VI a. above, maintaining the 80/20 ratio of ULSD to LSD is unimportant after the diesel fuel leaves the refinery. And in fact maintaining the 80/20 production requirement throughout the system may work against ensuring adequate

supply. There are no definitive estimates of the volumes of ULSD that will be lost to HSD downgrading or to interface/transmix. Without this knowledge, refiners cannot properly size ULSD units to make up for these losses. If refineries design their ULSD units based on today's distribution system performance (which is what they are designing for), the 80/20 ratio will be maintained but the total ULSD and LSD supply at the marketing facilities will be inadequate to meet demand.

EPA should amend the regulations to correct for this problem. Assuming that the whole Highway diesel regulation will not be reopened, there are very few options for EPA to do this. One possibility is to adapt the credit trading system to look at the entire pool rather than just the 80/20 ULSD/LSD ratio. It would be best if this were accomplished by combining the highway diesel fuel requirements in conjunction with the non-road rulemaking. It is unclear exactly how to build such a complicated credit trading system, but the oil industry is willing to work with EPA and OMB in an attempt to resolve this issue.

THE REPORT IS OVERLY OPTIMISTIC

EPA has been thorough work conducting and documenting refinery meetings. However, EPA's statement in the report that: "Virtually all refiners are planning their approach for compliance with the 2006 diesel fuel sulfur standard." could be misleading to the non-refining portion of the audience. Planning for compliance **can and does include shutting down or selling refineries where the large capital investments required by this regulation cannot be economically justified.** Planning can also **include abandoning the Highway diesel market** by seeking other markets, such as exportation, for higher sulfur diesel/distillate components or by planning alternative operations and/or investments to convert distillate volumes to gasoline.

This report has also overemphasized the positive aspects of future ULSD production by refineries and neglected to include pertinent information, which is necessary to form a balanced picture of the situation. Two refinery closures due at least in part to this regulation have already been announced. In addition to these, at least ten other refineries—and perhaps many more—have been identified for potential sale, due at least in part to this regulation and its very large investment requirements. Whether this regulation is, to a greater or lesser degree, responsible is not the overriding concern. If these refineries shut down or do not make ULSD investments, it will have a major impact on ULSD supply. Together these refineries discussed above represent over 1,000,000 barrels per day of crude processing capacity and from 160,000 to 180,000 barrels per day of distillate. Given the magnitude of these early announcements, the final tally of lost ULSD capacity may be quite large. This possibility should not be downplayed or ignored.

The report should present a more balanced picture of the fuels process. It should include a list of all the potential distribution system problems that it does not address and provide a list of refineries that have publicly announced that the present owner can not justify the investments required by this regulation. The

report should also explain that refinery planning may well include shutting down, selling the refinery abandoning the highway diesel business.

VII. CONCLUSIONS

Based on limited data and a narrow focus on specific refinery technologies, EPA's report gives an overly optimistic picture of the implementation of the fuels requirements for the 2007 Heavy Duty Highway Diesel Rule. EPA should examine all of the issues raised in these comments, plus those raised in comments from other parties (e.g., diesel marketers) and present a more balanced picture of implementation of the fuels provisions of the rule. At the very least, EPA should present a list of issues not considered within its report or by the Clean Diesel Independent Review Panel that are likely to have a significant impact on implementation of this rule. Such a list should also be included in the final report the Panel presents to the Agency this fall. The issues so identified may then be taken up in subsequent implementation activities, such as the November workshop discussed by EPA at the late June 2002 Panel meeting.